INDUSTRIAL MEDICINE AND SURGERY

Volume 22 JULY 1953 Number 7

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1. Peck, S. M.; Traub, E. F., and Spoor, H. J.: Aqueous Solutions of Sodium Propionate with Chlorophyll as a Therapeutic Agent: A.M.A. Arch. Dermat. & Syph. *67*:263, 1953.

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This Journal is dedicated to the advancement of sound industrial medicine, including the surgery of industrial trauma. To that end its varying contents will embrace scientific papers, reports, digests, news items and official statements, together with editorial comment. The editorial policy is to avoid undue censorship. Some contributions ably prepared will be published although contravening the personal opinions of the editors. Care will be exercised in checking the accuracy of known facts, as printed, but in all other respects statements and opinions are those of the author and may not be shared by the editors. On any article, the editors reserve the right to comment favorably or otherwise, in the current or any subsequent issue. On this basis, contributions are invited. The opinions expressed in any contributions, including the editorials of this Journal, do not necessarily reflect the attitude or opinions of any associated organization.

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THE PERMANENT International Committee on Industrial Medicine, which met in Lisbon in September, 1951, on the occasion of the Tenth International Congress, has decided that the Eleventh Congress should be held in Naples, in September, 1954.

THE RAMAZZINI SOCIETY is having its 1953 rendezvous at Lake Clear Inn, Lake Clear, New York, September 18-20. LEMUEL MCGEE, M.D., Medical Director, Hercules Powder Company, and JAMES H. STERNER, M.D., Medical Director, Eastman Kodak Company, are this year's "Servants."

HENRY M. BROWN, M.D., of Belle, plant physician for E.I. du Pont de Nemours & Company, retired May 1 after 33 years' service with the du Pont Company. He has been located at the Belle plant for the past 17 years. DR. BROWN accepted appointment as County Health Commissioner of Clinton county, Ohio, effective May 8, and will be located at Wilmington, in that state.

EUGENE J. RYAN, M.D., who has been on the medical staff at the Du Pont plant at Belle since January, 1952, has been appointed plant physician to succeed DR. HENRY M. BROWN. DR. RYAN is a native of Hazelton, Pennsylvania. He had his pre-medical training at Notre Dame, received his M.D. from Jefferson Medical College, Philadelphia, in 1944, interned at St. Joseph's Hospital in Reading, Pennsylvania, and served as chief resident physician there until 1946, when he entered active service as a medical officer in the Marine Corps, being released in 1948 with the rank of captain. He engaged in private practice in Reading until 1951, when he accepted appointment on the medical staff of the Du Pont Company at Wilmington, Delaware.

THE Institute of Industrial Health, University of Michigan, Ann Arbor, is sponsoring a series of television programs to continue throughout the year at intervals of four to six weeks. They will be given on Sundays at 1:00 P.M. over station WJBK-TV, Detroit (Channel 2). The first program, entitled "Sunlight and Sunburn," was given

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on May 16. DR. WILLIAM B. TAYLOR, of the University Department of Dermatology, and MARION FRENCH, Research Assistant in the Institute, were speakers.

THE Sociedad Cubana de Medicina del Trabajo at its recent Annual Meeting elected its new governing body for 1953-55, as follows: Presidente: DR. MANUEL GARCIA AVILA, Director del Instituto de Reeducacion de Invalidos del Trabajo; Vice-Presidentes: DR. MARCELO DE CATURLA; DR. PEDRO NOGUEIRA; Secretario Letrado Consultor: DR. RAFAEL PENALVER BALLINA, Director Medico de Autobuses Modernos; Tesorero: DR. PELAYO PELAEZ; Vocales: DR. MANUEL TABOAS; DR. THOMAS ARAMBURU; DR. FRANCISCO CARUANA. At this meeting, DR. CAREY P. MCCORD was designated a Correspondent Member of the Society.

THE Regents of the University of California have appointed THOMAS J. HALEY Associate Clinical Professor of Industrial Medicine at the University of California at Los Angeles, effective as of February 1, 1953.

RODNEY R. BEARD, M.D., M.P.H., Past-President of the Western Industrial Medical Association, Professor of Preventive Medicine at the Stanford University Medical School, has been appointed a Clinical Professor of Occupational Medicine in the School of Public Health at the University of California.

THE University of Michigan, Institute of Industrial Health and School of Public Health, now have available printed copies of the proceedings of the Fourth Discussional on Industrial Health Programs conducted last December at Ann Arbor on the subject, "The Worker as a Member of the Industrial Health Team." Copies may be obtained at $1.00 each from the University of Michigan Press, Ann Arbor.

LIEUTENANT COLONEL EDWARD J. DEHNE, Medical Corps, U.S. Army, Chief of Preventive Medicine, U.S. Army Caribbean, participated in the scientific program for the 558th meeting of the Medical Association of the Isthmian Canal Zone, May 19, 1953, at the Palo Seco Leper Colony, Canal Zone. As a military member of

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VALUE AND SAFETY OF "TRILENE" INHALATION ANALGESIA PROVED IN UROLOGIC PRACTICE

Study shows self administration with "Duke" University Inhaler has wide application

DURHAM, N. C.—In certain painful urologic procedures, "Trilene," self administered with the "Duke" University Inhaler, safely induces marked analgesia with few if any side effects, and provides convenience of administration, reported Victor A. Politano, M.D. of the Department of Urology, Duke University, Durham, N. C. This paper was recently presented in Havana, Cuba, before the Southeastern Section of the American Urological Association.

In over 100 cases, specially selected because a customarily painful or difficult diagnostic or therapeutic procedure was anticipated, and because "general anesthesia or heavy sedation was not practical or advisable," results with "Trilene" analgesia were described as excellent in 79 cases, and good in 28.

Stressing the need for patient cooperation and induction of adequate analgesia, Dr. Politano said "The occasional failures encountered have been due to improper or insufficient instruction in the use of the inhaler and hurried instrumentation before proper analgesia."

These findings add further support to the extensive clinical evidence of effectiveness and safety of self-administered "Trilene" analgesia in obstetrics, as well as in surgical procedures such as the reduction of fractures, incision and drainage of abscesses, removal of painful dressings.

"Trilene," self administered with the "Duke" University Inhaler, will usually provide smooth and rapid induction of analgesia with minimum or no loss of consciousness. Unconsciousness automatically interrupts inhalation. Recovery is rapid, and nausea and vomiting rarely occur.

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Further information on "Trilene" or the "Duke" University Inhaler (Model-M) may be obtained by writing to Ayerst, McKenna & Harrison Limited, 22 East 40th Street, New York 16, N. Y.

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the panel, he discussed the military occupational importance of leprosy, the part immunity plays in the epidemiology of leprosy, and the public health control measures for leprosy.

M.D. Day at Caterpillar

HAROLD A. VONACHEN, M.D., Director of Caterpillar Tractor Company's Medical Division, his Assistant, M. H. KRONENBERG, M.D., and Community Relations Department Manager FRED R. JOLLY, were hosts to the monthly meeting of the Peoria County Medical Society in April. The meeting drew more than 150 members to an evening session. The visiting doctors were taken on a tour of the company's diesel engine factory and then served dinner in one of the company's cafeterias. Highlight of the evening was a visit to the Medical Division, where plant doctors, nurses and technicians were on hand to show the guests around. They saw Caterpillar's extensive Medical Department, first aid stations; x-ray and other equipment; watched testing machines determine the purity of the air and its content of gas and dust; heard about Caterpillar's great safety record, the finest in the industry. In short, they saw industrial medicine at its best. In the Caterpillar theater, top management explained the insurance program and business operation, as well as the hospitalization plan. Finally, the meeting was thrown open for questions and answers. One of the outstanding features of the company's "MD Day" was a system of telephone relays from Peoria Physicians Telephone Exchange to Caterpillar's switchboard, whereby any Society mem-

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Saves time makes easier ties

Surgeons welcome a new convenience—D & G Spiral Wound Surgical Gut. It is wound on a cylindrical reel—comes *ready for immediate use* in ligation and suturing. Spiral winding preserves all the original strength. None is lost through kinks or bends.

Nurses, too, save time with Spiral Wound Gut. No more unwinding from an old style flat reel and rewinding onto a rubber tube, glass rod or spindle.

For surer hand ties

When the surgeon makes a series of hand ties, D & G Spiral Wound Surgical Gut USP unreels in his hand, free from kinks, with all its tensile strength preserved.

The gut should be gently pulled out straight immediately after removal from the tube.

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D & G Spiral Wound Gut is the latest Davis & Geck contribution to improved suturing. "Timed-absorption" surgical gut is another—this exclusive D & G method embodies accurately graded degrees of chromicizing. The suture resists digestion most strongly during the first postoperative days, when greatest strength is needed. It is absorbed more rapidly when tissues have regained their natural strength.

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ber could be reached within minutes at any point in the tour. Society members pronounced the occasion a great success, and many letters of appreciation were received by Caterpillar. "Few doctors today have the time or opportunity to see industrial medicine in a progressive company," said DR. VONACHEN. "They're just too busy. Our 'MD Day' gave them this opportunity by combining the program with their monthly meeting. Incidentally, it's amazing how men who devote their lives to the human body and its ailments can also demonstrate such a great interest in things mechanical. They loved that diesel engine factory."

Armco

THE Medical Departments of Armco plants work 24 hours a day in the year, making quick and efficient care available to any employee who is injured in the plant. They also have the obligation to look after the general health of the entire organization. W. H. RICE, M.D., Medical Director of Armco's Ashland Division, supervises a staff of eight nurses and a secretary in providing medical care for Ashland Armco employees. They are thoroughly trained, enthusiastic Armco workers, proud of the part that they play in the organization. Preventive medicine and early detection of sickness and disease are probably the most important jobs of the Medical Department. Periodic examinations are made of nearly every employee and the state of his health is discussed with him. Should he need further attention, he is advised to consult his family physician. Every effort is made to keep trained employees healthy and on their jobs. Complete physical examinations, including chest x-rays, are made of all prospective employees. In addition to detecting any hidden illness, these examinations also help greatly in assigning employees to appropriate jobs. All injuries receive prompt attention at Ashland Armco's new hospital, and minor ailments are also treated at dispensaries at the Norton and Sixth Street Blast Furnaces. More serious injury cases are taken to area hospitals for further treatment and observation.

—*Ashland, Kentucky, Independent,* May 20, 1953.

University of California

DURING the month of May, ground was broken on the campus of the University of California at Berkeley, for a six-story building to house the School of Public Health. This will have a section devoted to occupational health, consisting of class rooms, research and toxicology laboratories, faculty and student rooms, and offices. Graduate courses are taught in occupational health, leading to the degree of M.P.H. in industrial hyigiene and the Dr. P.H. for candidates who possess the M.D. degree. There will also be a section for graduate students in cancer research. Courses in occupational health and industrial medicine, with field and laboratory problems and practice, engineering in safety, sanitation, and environmental factors affecting the health of workers will be featured, in addition to special courses in social welfare, public health, and preventive medicine. The building will house the public health library, with its reading and research rooms.

This Month

THROUGH custom and usage, this has become the Publisher's Column; in it he may write freely about anything and or anybody—even the Editor. So this is about the Editor. That distinguished gentleman has lately found himself in the position described in certain words of Hamlet: "Oft it chances in particular men that for some vicious mole of nature in them. . . . their virtues else—be they as pure as grace, as infinite as man may undergo—shall in the general censure take corruption from that particular fault." The cause of the "corruption" in his case, however, is not a "vicious mole," but another kind of animal—a harmless old blind hog. That friendly creature, rooting about in an area of rich experiences and interesting recollections, seems to have preempted the whole escutcheon of a long and useful career. Unwittingly, and without intent or malice, he fills the field fourquarters full, and hides all else. And now the Editor's dilemma is that despite his memorable attainments as physician, scientist, researcher, author, consultant, the first—and, too often for comfort, the only—response to mention of his name is: "Oh, yes! A Blind Hog's Acorns!" From all of which he is fearful that what fame is his may rest upon his least endeavor; that those in time to come who look upon his work may be unable to see the oaks for the acorns. But he is a determined man. So he stands among his oaks, holds up against the lightnings of comment his shield upon which is the Blind Hog, not rampant but rooting, and signalizes his defiance of what has happened by an invitation to it to happen again. His continuation of "A Blind Hog's Acorns" has been completed. It is titled "Acorns and Truffles." As before, "the Acorns mark the adventures that befall one quester for better understanding of the strange and sometimes devastating maladies produced by work and work materials and machines." But, new here, are the "Truffles," symbolizing achievements of other questers.

Important...

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THE INDUSTRIAL MEDICAL ASSOCIATION SPONSORED GROUP INSURANCE PROGRAM

The announcement from the Group Insurance Administration Office started the Charter Enrollment Period June 1st, 1953.

The Board of Directors of the I.M.A. on April 21, 1953 unanimously voted the sponsoring of a Disability Sickness and Accident Group Plan for the membership.

The I.M.A. Group Plan is the most comprehensive available.

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8. The individual member's coverage is non-cancellable to age 70. (The average individual policy terminates at age 60 or 64.)
9. Full benefits are payable under this group coverage regardless of any other disability insurance a member might carry. (No pro-rating clause.)
10. No physical examination required at any time.
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For complete information regarding the plan
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Industrial Medical and Related Chronology selected and arranged by ROBERT T. LEGGE, M.D., F.A.C.S., Berkeley, California

"Not a change for the better in our human housekeeping has ever taken place that wise and good men have not opposed it—have not prophesied that the world would wake up to find its throat cut in consequence. . . ."
—James Russell Lowell

♋ = Cancer — June 22-July 22 | ♌ = Leo — July 23-August 21

1953 JULY (Circa)

1917—Hawaii was the first jurisdiction of the United States to enact occupational disease compensation legislation. 1917—Otto P. Geir, of Cincinnati, gave his famous address on the philosophy of prevention: "The Human Potential in Industry."
1918—W. G. Thompson organized in New York City a Clinic for functional re-education of industrial and war cripples.
1919—Harry E. Mock, Medical Director, Sears Roebuck and Company, Chicago, published his textbook, "Industrial Medicine and Surgery."
1921—C. R. Hoover, an American chemist, developed Hoolamite, the activated pentoxide indicator for testing air samples for CO.
1922—Leonard Greenburg and G. W. Smith, U.S. Bureau of Mines, developed the impinger for sampling aerial dust.
1922—Alice Hamilton investigated the industrial diseases of fur cutters and hatters.

☽ 1st Quar. ○ Full Moon ☾ 4th Quar. ● New Moon

1 ♋ W — 1953—Warren A. Cook, of Chicago, became Associate Professor of Industrial Health and Hygiene, School of Public Health, University of Michigan. Recipient of Donald E. Cummings Award, 1953.
"Let every dawn be as the beginning of life"— Ruskin

2 ♋ Th — 1897—Ronald E. Lane, a member of the British Industrial Health Research Board, born at Margate, England. Professor of Occupational Health, University of Manchester.
1901—Donald Stewart, Medical Director, Austin Motor Company, born at Oban, Scotland.

3 ☾ Fr — 1897—John Evans, Professor of Obstetrics at Rush, where he was Editor of *N.W. Medical and Surgeons Journal*, died in the state of Colorado.
"Let every man praise the bridge that carries him over"—English Proverb

4 ♋ Sa — 1776—Declaration of Independence signed at Philadelphia. Five of the signers were physicians: Drs. Benjamin Rush, J. Bartlett, M. Thornton, A. Wolcott, and L. Hall.
"The wisest man sometimes acts weakly, and the weakest sometimes wisely"—Lord Chesterfield

5 ♋ S — 1867—Sir William Lawrence died at London. Successor to Abernathy; noted English surgeon and lecturer at St. Bartholomew's Hospital.
"Laws should be made, not against quacks but against superstition"—Virchow

6 ♋ M — 1895—William P. Shepard born at Hull, Iowa. Past President National T.B. Association, the A.P.H.A., and the Western Industrial Medical Association; Clin. Prof. Public Health, Stanford Medical School; recently appointed to the Council of Industrial Health, A.M.A.

7 ♋ Tu — 1899—Anna M. Baetjer, Professor of Physiological and Industrial Hygiene, Johns Hopkins University, born in Baltimore, Maryland. Distinguished for her contributions on the effects of temperature, humidity, and atmospheric pressure.

8 ♋ W — 1857—Alfred Binet born at Nice, France. Director of Laboratory of Physiological Psychology at Sorbonne. Developed the test for intelligence.
1842—D. J. Larrey, Chief Surgeon of Napoleon's Army, born at Beaudeau, France.

9 ♋ Th — 1880—Paul Brocca, eminent French surgeon and anthropologist, died at Paris. Discovered Brocca's convolution center of speech and introduced craniometry.
"The heart is a triumphant and mighty emperor that ends as the breakfast of a silly little worm"—Montaigne

10 ● Fr — 1888—James G. Townsend, a senior surgeon, U.S.P.H.S., Division of Industrial Hygiene, for several years, born at Philadelphia.
"I would rather be a transformed ape than a degenerate of Adam"—Brocca

11 ♋ Sa — 1808—William Shippen of Philadelphia, first in America to lecture on midwifery; established a hospital for its teaching; died at Germantown, Pennsylvania.
"The future belongs to those who shall have done most for suffering humanity"—Pasteur

12 ♋ S — 1872—Ludwig Teleky born in Vienna, Austria. Professor of Public Health and Industrial Medicine, University of Vienna. Now retired; resides in New York City. Author of 10 books and 450 articles on industrial medicine and hygiene.

13 ♋ M — 1857—Franklyn H. Martin, a distinguished Chicago surgeon, born. He organized the American College of Surgeons.
1793—Jean Paul Marat, the French physician and revolutionist, assassinated by Charlottea Corday during the French Revolution.

14 ♋ Tu — 1858—Sir Jonathan Hutchinson, a St. Bartholomew surgeon, described the effects of infantile syphilis in developing notched or peg-shaped incisors—also the Hutchinson Triad (interstitial Keratitis, notched teeth, and labyrinthine disease) in syphilis.

15 ♋ W — 1867—Jean B. E. A. Charcot, a French physician and explorer, born at Neuilly Sur-Seine. Twice he led a French expedition to the Antarctic and made some discoveries.
1868—William T. G. Morton, a Boston dentist, died. Discoverer of ether anesthesia.

16 ♋ Th — 1910—Alexander J. Stone died at St. Paul. Professor of Gynecology, University of Minnesota, and founder of Minnesota's first medical journal.
1798—By act of Congress the U.S. Marine Hospital was established.

17 ♋ Fr — 1775—Benjamin Church was made Director General (salary $4 a day) of the newly established U.S. Army Medical Department.
"It is easy to get a thousand prescriptions, but hard to get one single remedy"—Chinese Proverb

18 ☽ Sa — 1886—Frank G. Boudreau, M.D., internationally distinguished in epidemiology, nutrition, and hygiene, born at New Glascow, Canada. Director, Midbank Memorial Fund, and Chairman of the Lasker Award.
"Blest the hour wherein I bought this book"—Ben Johnson

19 ♋ S — 1865—Charles H. Mayo, one of America's master surgeons, born at Rochester, Minnesota. Established the Mayo Foundation for Medical Research and Education, University of Minnesota.
"I'd rather wear out than rust out"

20 ♋ M — 1836—Birthday of Sir Thomas Clifford Allbutt, a famous English physician. Professor of Physics, University of Cambridge. Cardiologist and historian in ancient medicine.
1870—Allrecht von Graefe, celebrated oculist and Professor at University of Berlin, died.

21 ♋ Tu — 1878—Clarence D. Selby, distinguished industrial physician, born in Des Moines, Iowa. Formerly Medical Director, General Motors; Past-President I.M.A.; recipient Knudsen Award; now on the faculty of the School of Public Health, University of Michigan.

22 ♋ W — 1745—John Dupuy, the first medically trained obstetrician, died in New York.
1794—James Lind, a British naval hygienist and surgeon, died at Gosport, Hampshire, England.
"Great men are not always wise"—Job

23 ♌ Th — 1941—Air Hygiene Foundation of America incorporated as the Industrial Hygiene Foundation of America.
1809—William Wood Gerhard born in Philadelphia. Member of the staff of the Philadelphia Hospital and Alms House. First to differentiate typhus from typhoid fever.

24 ♌ Fr — 1819—Joseph Gilbert Holland born at Belchertown, Massachusetts. A physician, poet, founder of *Scribner's Monthly* and later editor of *Century Magazine*.
"Never chase a lie. Let it alone and it will run itself to death"—Lyman Beecher

25 ♌ Sa — *"Prejudice is not held against people because they have evil qualities. Evil qualities are imputed to people because prejudices are held against them"—Marshall Wingfield*
"The only way to learn to play the harp is to play the harp"—Aristotle

26 ♌ S — 1728—John Friend, an English physician in London, died. Member of Parliament, and author of "Physic from the Time of Galen to the Beginning of the Sixteenth Century."
"An old-timer is one who can remember when the wonder drugs were mustard plasters and castor oil"—Shannon Fife

27 ♌ M — 1775—The Army Medical Service at the behest of General George Washington organized by an act of Congress.
1830—John Gale, a pioneer U.S. Army surgeon who served at Camp Missouri and Fort Atkinson and was with Ashley on the Arikara Expedition, died at Fort Armstrong.

28 ♌ Tu — 1898—William Pepper, an American physician, Professor of Medicine and Provost of the University of Pennsylvania, died at Pleasanton, California.
"This is the final test of a gentleman: his respect for those who can be of no possible service to him"—Phelps

29 ♌ W — 1841—Gerhard H. A. Hansen, a Norwegian pathologist, discoverer of the bacillus of leprosy, President of the Museum at Bergen, born.
"It is magnificent to grow old, if one keeps young"—Fosdick

30 ♌ Th — 1941—George M. Price, a New York pioneer in industrial health, a founder of the I.M.A., and member of the New York State Factory Commission, died at the age of 78.
"When two men in a business always agree, one of them is unnecessary"—William Wrigley, Jr.

31 ♌ Fr — 1859—Theobald Smith, a celebrated American pathologist, Professor at Harvard University, born at Albany, New York. Investigator of the Texas cattle fever, studies in parasitism, vectors, and immunity. Recipient of the Sedgwick Memorial Medal in 1930.

"The man who is worthy of being a leader of men will never complain of the stupidity of his helpers, or the ingratitude of mankind, or of the inappreciation of the public. These are all part of the great game of life, and to meet them, and not go down before them in discouragement and defeat, is the final proof of power"
—Elbert Hubbard

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1. Silbert, N. E.: New England J. Med. 242:931, 1950.
2. Eisenstadt, W. S.: Journal Lancet 70:26, 1950.

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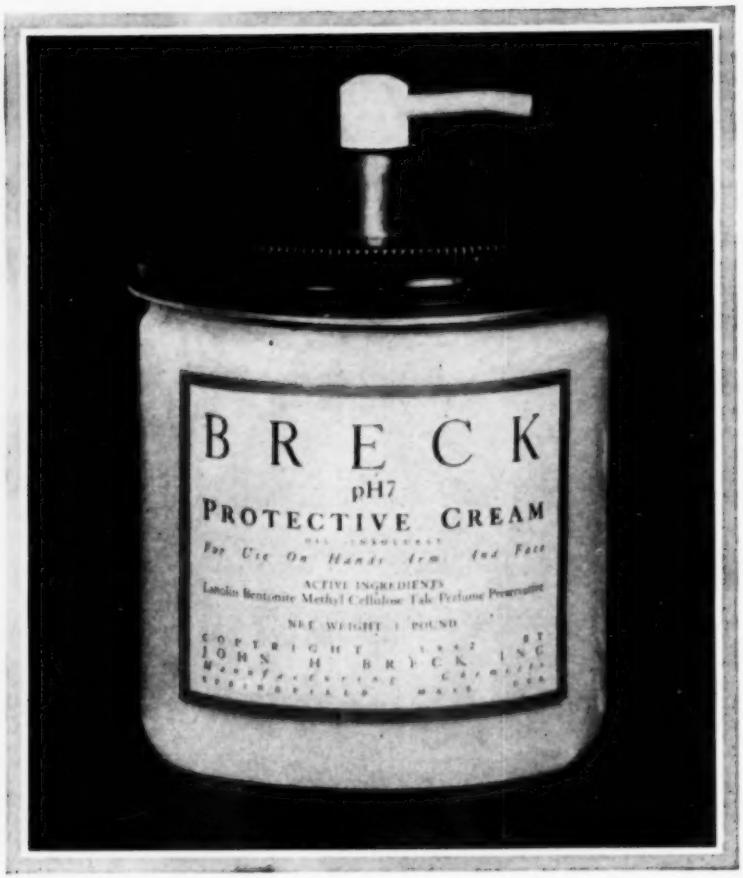

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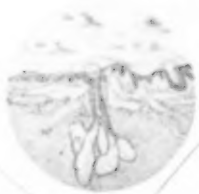
impetigo

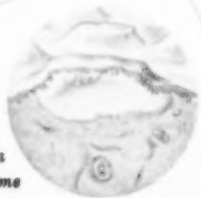
skin infections and antibiotics

acne



pyoderma

folliculitis



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1. *Bednar, G. A.: South. M. J. 46:298 (March) 1953.*
2. *Wright, C. S., et al.: A. M. A. Arch. Dermat. & Syph. 67:125 (Feb.) 1953.*
3. *Robinson, H. M., et al.: South. M. J. (in press).*
4. *Andrews, G. C., et al.: J. A. M. A. 146:1107 (July 21) 1951.*

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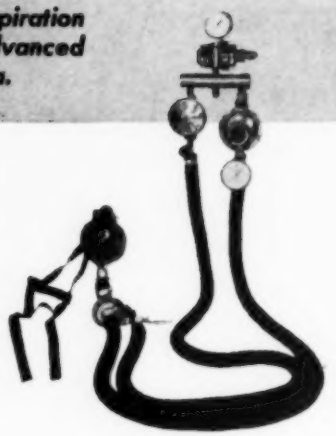

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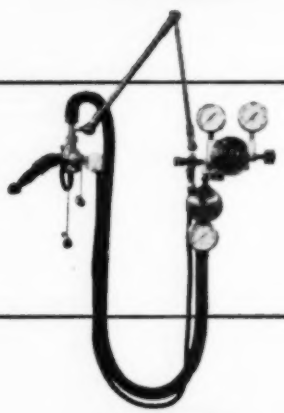

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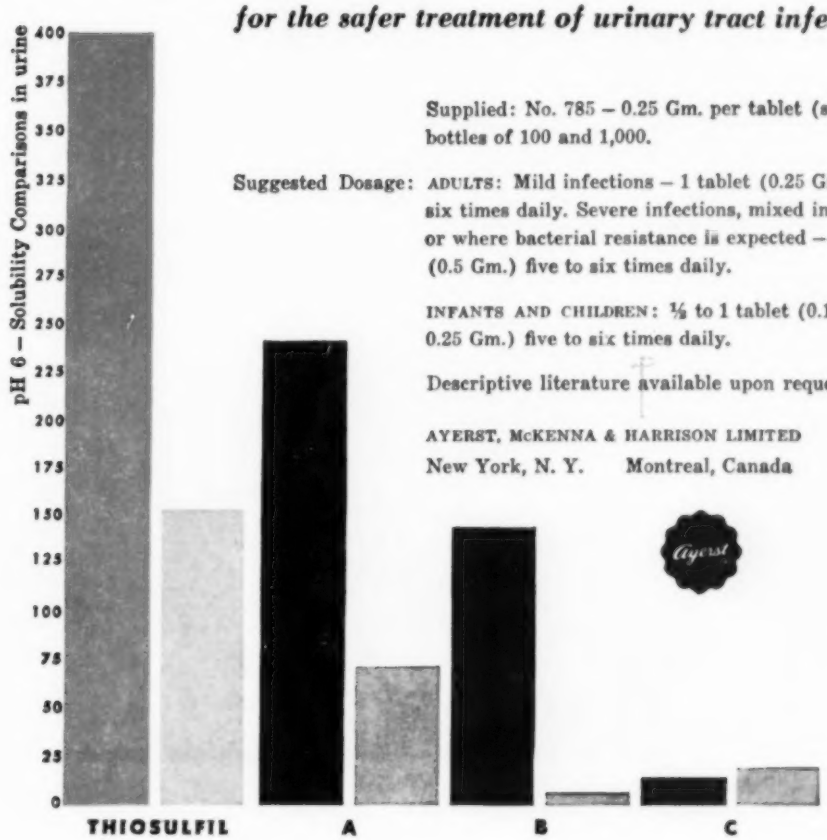

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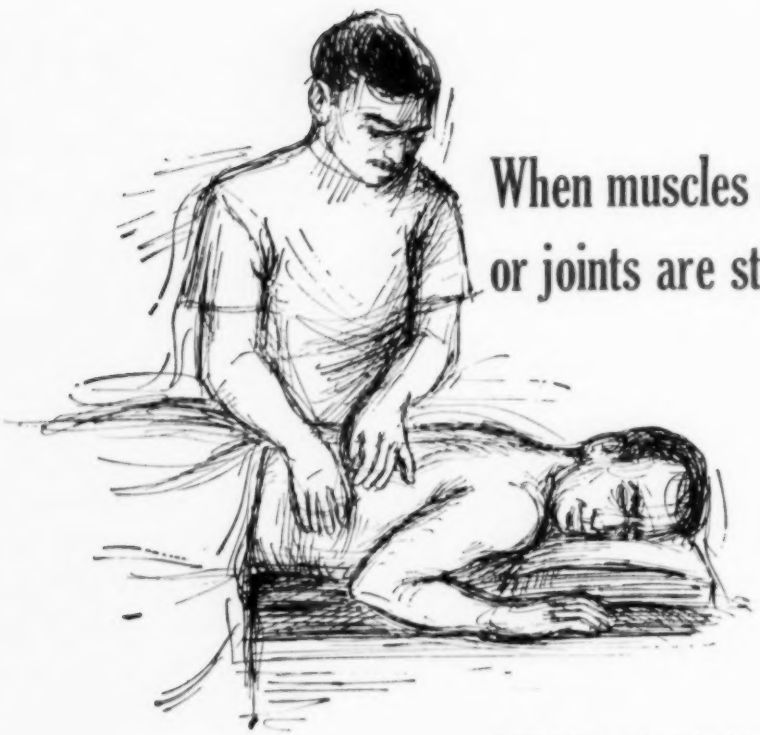

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more effective.... because they provide healing crude Norwegian cod liver oil (rich in vitamins A and D and unsaturated fatty acids, in proper ratio for maximum efficacy).

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Worker after using ordinary industrial cleanser

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- **Saves money because protective devices are no longer necessary.**
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LIXOIL has been thoroughly tested against other cleansing agents, and is a peer to all of them.*

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for the removal of oil from the skin

TRY LIXOIL ON YOUR DIRTIEST WORKER
and
LISTEN TO HIS REACTION!

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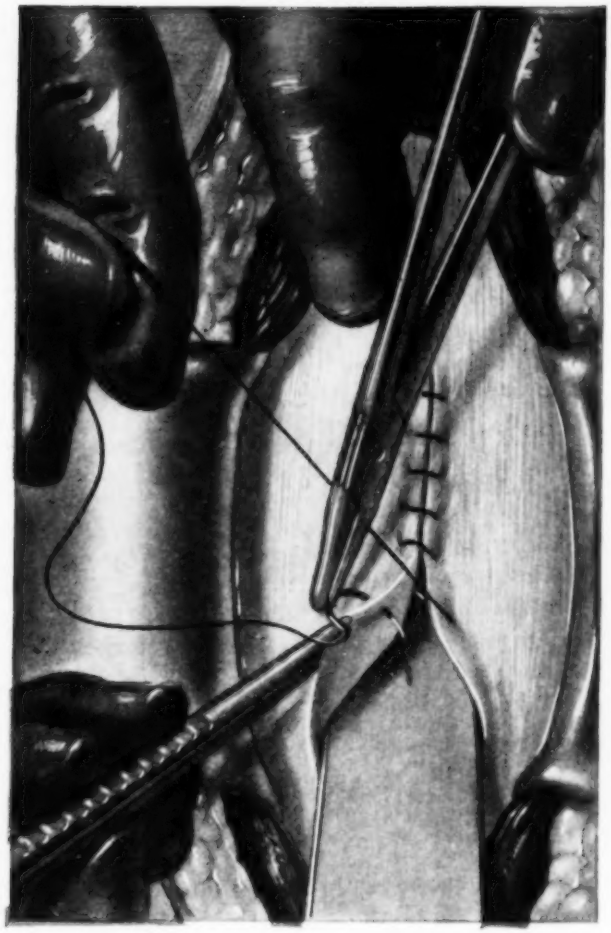
* Morris, G. E., & Maloof, C. C.: *Causes of Cutting Oil Dermatitis*, N.E.J.M., 247:440 (Sept. 18) 1952.
Morris, G. E., & Maloof, C. C.: *An Analysis of Some of the Causes of Cutting-Oil Dermatitis* (Part I). Ind. Med. & Surg., 21:573 (Dec.) 1952.
Morris, G. E., & Maloof, C. C.: *An Analysis of Some of the Causes of Cutting-Oil Dermatitis (Part II: A Study of Protective Creams), Ind. Med. & Surg., this issue.*



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Patients move about more freely after their operations and are out of the hospital sooner when their wounds have been closed with a minimum of trauma. Davis & Geck offers two modern aids to faster and more even healing:

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In suturing with Atraumatic needles there is less tissue trauma, faster and more even healing. The D & G Atraumatic needle is joined to its suture smoothly. Needle and suture are about the same diameter. No big eye and double strand of suture are dragged through the tissue. Sutures on Atraumatic needles are economical, too. Surgery is easier and faster, needles are always sharp, *no time is lost while the nurse threads needles.*

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Dosage: 3 to 9 grains three to four times a day, before meals and at bedtime.

Available in 1½-grain and 3-grain tablets.

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Non-Narcotic Vasodilator and Antispasmodic

TABLETS

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INDUSTRIAL MEDICINE AND SURGERY
JULY, 1953

Arsenic Trioxide Exposure in Industry

SHERMAN S. PINTO, M.D., M.P.H., Denver, Colorado
CHARLES M. McGILL, M.D., M.P.H., Tacoma, Washington

ARSENIC trioxide, known industrially as "white arsenic," is utilized in a wide variety of industrial processes. Agricultural insecticides account for about half of the domestic consumption of arsenic, but substantial amounts are used in weed killers, the glass industry, cattle dips, and dyestuffs. Only small amounts are used for medical purposes. Important and relatively new uses for arsenic have been developed in processes for debarking trees and preserving wood.

In the United States annual consumption of arsenic trioxide ranged from 40,000 tons in 1944[1] to 15,000 tons in 1949.[2] World production varied from an estimated 66,300 metric tons in 1943 to 40,000 tons in 1946. Figures of production from the Soviet Union are only estimates and make world production figures somewhat unreliable.

Production of Arsenic Trioxide

ALMOST all rocks contain small amounts of arsenic and, as they break down under the influence of wind and weather, the arsenic present finds its way into the soil. As a consequence normal soil usually contains from one to 40 parts per million of arsenic. Animals exposed to an environment containing arsenic quite naturally absorb this material during the process of living. Sea water contains 0.006 to 0.03 parts per million of arsenic[3] and certain crustaceans remove arsenic from the water passing through their gills. Oysters have been found to have 3 to 10 ppm of arsenic in their tissues, mussels 120 ppm, and prawns up to 170 ppm. It has been estimated that a mussel may pass 10 gallons of water through its siphon tubes in 24 hours so any tendency of these tissues to absorb arsenic will result in a large accumulation of this material.

In the United States arsenic as such is not mined separately, but is produced principally as a by-product in the smelting of copper and lead. When ores or concentrates containing these metals are smelted, the arsenic goes off in the flue gases where, with other dusts, it is caught by electrostatic precipitators or filters as a dust. Arsenic trioxide does not melt at atmospheric pressure but sublimes at a temperature of 218°C.

CONSTITUENTS OF THE CRUDE DUST: Flue dusts containing arsenic are roasted in Godfrey roasters and the arsenic trioxide driven off. It is collected in what are known as arsenic kitchens. These are long brick rooms in which the hot roaster gases bearing arsenic trioxide fume and vapor are circulated as they cool. The oxide settles to the floor of the rooms as a coarse dust and also forms crystalline deposits on the walls and ceilings. It is removed from the kitchens and prepared for shipment as a dust containing approximately 97% As_2O_3, the principal impurity being Sb_2O_3. Holmquist,[4] in his published figures of crude arsenic dust analyses as found in a Swedish smelter, lists other materials which may also be found as contaminants of the crude dust.

It should be noted that under the conditions of smelting, substantially all of the arsenic occurs as an oxide, most of it being in the trivalent and not the pentavalent form.

SIZE-FREQUENCY DISTRIBUTION OF ARSENIC TRIOXIDE DUST: A substantial part of the oxide, over 23% by particle count, is over 5 μ.[5] On a weight basis all but a small fraction is in the large size range which is what one would expect from the very nature of the process and especially from the physical properties of As_2O_3. This oxide sublimes and does not melt. The vapor is carried in a closed system to the kitchens, previously mentioned, and every effort is made to produce crystals of comparatively large size as that is what is wanted for the trade. Sieve analyses of the final product show that over 98% (by weight) is retained on a 325-mesh sieve. In either the crude or refined states it is not material which flies about like finely ground minerals or dry paint pigments.

Dunlap[6] has suggested these large particles (or possibly agglomerates) if inhaled, can impinge on the nasal septum and the dust be dissolved on the moist mucous membrane surface. A high concentration of the dissolved As_2O_3 dust, in a small area, however it gets there, can cause

Presented at the Thirty-Eighth Annual Meeting of the INDUSTRIAL MEDICAL ASSOCIATION, Los Angeles, April 23, 1953.

necrosis of the mucous membrane. When this happens there is a localized area of ulceration, and the blood supply of the underlying cartilage, which receives its nutrition from the covering mucous membrane, is destroyed. The cartilage beneath the ulcerated area drops out, leaving a hole in the cartilaginous septum of from 3 to 8 mm. in diameter.

The Mechanics of Working with Arsenic Trioxide

PROTECTION OF WORKERS: The protective clothing which should be worn by men working with arsenic trioxide dust has been evolved from years of practical experience. We recommend that such workers wear clean clothes every day. These include underwear, socks and coveralls. It is most practical to have two dressing rooms with a shower room between. Non-work clothes are left in one locker room and work clothes in the other. Thus, at the end of a day's work, the employee automatically goes through a shower room where he gets a bath before he puts on his street clothes.

Working clothes consist of cotton underwear and socks over which is placed a one-piece denim coverall with an attached hood. During work the attached hood is pulled over the head where it covers scalp, ears, and back of neck. Draw strings at the wrist and ankles can be tightened to prevent the entrance of dust. Shoes worn at work are left in the "work" locker room after hours.

Respiratory protection is necessary, but the respirators approved by the U.S. Bureau of Mines have not proved to be satisfactory. In every instance we found that arsenic trioxide dust would irritate the skin where the respirator rested on the face. Use of a facelet for the respirator is not effective. We now are utilizing a respirator which consists of a hard rubber frame to hold large pieces of surgical sheetwadding over the nose and cheeks. Every time the respirator is removed the sheetwadding is replaced. This surgical sheetwadding has been tested against arsenic trioxide dust[7] and found to be quite effective. With test dust loadings ranging from 99 to 1740 mg/cu meter the efficiency of the mask using two layers of sheetwadding was 99%. Four layers of sheetwadding improved the efficiency slightly.

The protection described should be supplemented by dust-tight goggles if the air concentration of the dust is high. Conjunctivitis can be prevented by such a method.

It should be noted that the hood in covering the ears prevents arsenic trioxide dust settling in them. Dust in the ears (external canals as well as pinnae) if moistened, as by bathing, can irritate the external skin surface.

SELECTION OF WORKERS: Some men are unusually susceptible to skin irritation by arsenic dust and when this is discovered they should not be allowed to work in such areas. Pre-employment patch testing is of no use with this primary irritant, and only the trial-by-work method is practical. However, individuals with known chronic skin diseases particularly of an allergic nature should not be allowed to work in contact with arsenic dust. As in most exposures to irritating agents, the blond and reddish skinned workers are more sensitive than those with more skin pigmentation.

Urinary Arsenic Studies

CONTROLS: Published figures of normal urinary arsenic levels among industrial workers not exposed to arsenic are not too plentiful. Watrous and McCaughey[8] summarized the published figures in 1945 and found in their own study of 13 applicants for work (presumably unexposed to arsenic) a range of 0.003 to 0.037 mgm. As_2O_3/100 cc. urine with a mean value of 0.017 mgm As_2O_3/100 cc. urine. This is 0.126 milligrams of arsenic (As) per liter of urine. Webster[9] in a study of 46 persons with no known exposure to arsenic salts found their average urinary arsenic value was 0.014 mgm As/liter of urine.

In this study, urine samples of workers in a modern smelter were analyzed for arsenic by the Cassil-Wichmann procedure as modified by Thomas and Collier,[10] and all results are expressed as mgm arsenic per liter of urine. In each case, also, the urine specific gravity was determined and a correction factor for variations in specific gravity was applied according to the method of Levine and Fahy[11] for urinary lead determinations.

Levine and Fahy[11] in a study of urinary lead excretion concluded "renal lead excretion calculated as mass of lead per unit mass of total urinary solids is more representative of true exposure than when calculated as mass per unit volume or per unit time." Applying their formula to urinary arsenic values we found the corrected values show less fluctuation around the mean than do uncorrected values.

One hundred forty-seven urine samples from 124 individuals actively working in industry and having no known exposure to arsenic were analyzed. The average urinary arsenic value was 0.13 mgm/liter and the median was 0.10 mgm/liter. In this group of 147 samples 88% of them had less than 0.20 mgm As/liter. It should be noted, however, that several high values were found for which no ready explanation could be made. The three high values of the control group

TABLE I.
DISTRIBUTION OF 147 URINARY ARSENIC DETERMINATIONS OF NON-EXPOSED INDIVIDUALS

Mgm Arsenic per liter of urine	Number in Range	Per Cent of total Group (Cumulative)
0. -0.049	24	17.0
0.05-0.09	51	51.6
0.10-0.14	33	74.0
0.15-0.19	21	88.3
0.20-0.24	7	93.1
0.25-0.29	3	95.1
0.30-0.34	3	97.1
0.35-0.39	1	97.2
0.40+	4	100.0

were 0.53, 0.70, and 2.06 mgm As/liter. In Table I the distribution of these urinary arsenic determinations is given.

URINARY ARSENIC VALUES OF SPOT SAMPLES IN MEN EXPOSED TO ARSENIC TRIOXIDE: Eight hundred thirty-five spot urine samples were obtained from 348 men exposed to arsenic trioxide dust during the course of their work. The average urinary arsenic value (after correcting for specific gravity) was 0.82 mgm/liter. The median value of these 835 spot samples was 0.58 mgm/liter. In Table II the frequency distribution of these values is given, and these are shown graphically in Fig. 1.

TABLE II.
DISTRIBUTION OF 835 URINARY ARSENIC VALUES FOR MEN EXPOSED TO ARSENIC TRIOXIDE DURING WORK

Mgm Arsenic per liter of urine	Number in Range	Per Cent of total Group (Cumulative)
0. -0.19	95	11.38
0.20-0.39	182	33.18
0.40-0.59	145	50.58
0.60-0.79	113	64.13
0.80-0.99	72	72.73
1.00-1.19	56	79.43
1.20-1.39	43	84.58
1.40-1.59	27	87.82
1.60-1.79	23	90.57
1.80-1.99	19	92.85
2.00-2.19	12	94.29
2.20-2.39	12	95.73
2.40-2.59	6	96.45
2.60-2.79	6	97.17
2.80-2.99	7	98.01
3.00-3.19	3	98.37
3.20-3.39	1	98.49
3.40-3.59	3	98.85
3.60-3.79	2	99.09
3.80-3.99	1	99.21
4.00+	7	100.00

The frequency distribution of the urinary arsenic values of both controls and exposed individuals have been combined and are shown in Fig. 2. This figure shows the important "overlapping zone" in which the urinary arsenic value is not indicative either of exposure or non-exposure. Those men in this zone who are workers in arsenic dust are men who wear their respirators most faithfully. When the respirators are worn less faithfully, more As_2O_3 is absorbed and this is reflected in higher urinary arsenic levels.

URINARY ARSENIC EXCRETION OVER EXTENDED PERIODS OF TIME: During the course of this study, a number of men developed acute arsenical dermatitis. We feel the dermatitis resulted from breaks in the personal hygiene technique rather than from any deficiency of the technique itself. Treatment of the dermatitis was by the intramuscular injection of BAL (2, 3 dimercaptopropanol). To facilitate treatment, the patients were hospitalized and the drug administered intramuscularly (gluteals) every six hours day and night. The urinary arsenic excretion of 16 men so treated was followed over periods of three to six days. There was considerable fluctuation of urinary arsenic values within any one series and the initial urinary arsenic values varied widely. The average urinary arsenic excretory value of

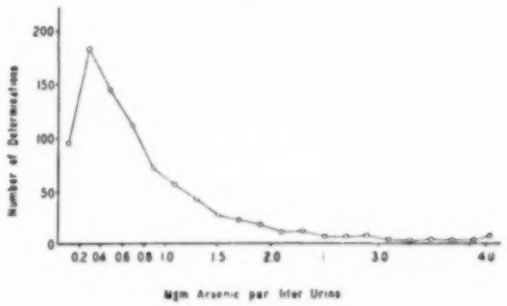

Fig. 1.
Frequency distribution of 835 urinary arsenic values found in the urine samples of 348 men working with arsenic trioxide dust.

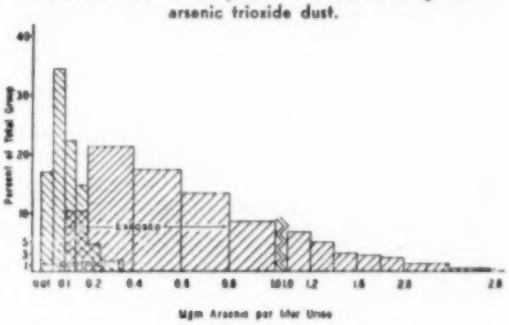

Fig. 2.
Comparison of frequency distribution of urinary arsenic values for control and exposed individuals.

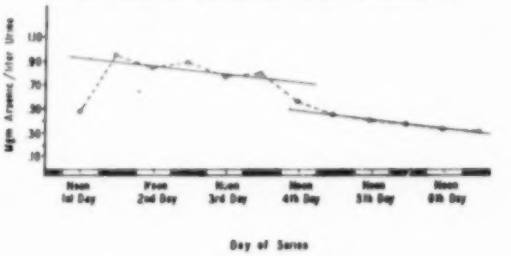

Fig. 3.
Average urinary arsenic values of 16 arsenical dermatitis patients receiving BAL therapy.

the 16 series was calculated for midnight and noon after the BAL injections were started. The averages are summarized in Table III and shown graphically in Fig. 3.

The figure shows several interesting findings. First, the injection of BAL seems to stimulate the initial excretion of arsenic. Secondly, the diminution in excretory rate of arsenic seems to be almost uniform over the ranges studied. The apparent break at noon of the fourth day is due to the inclusion of several individuals in the series who had high urinary arsenic levels but were only studied for four days. The superimposed average excretory rate lines of the first four and last three days are parallel and indicate a urinary excretion of about 0.7 mgm arsenic per liter urine per 24-hour period.

TABLE III.
AVERAGE URINARY ARSENIC VALUES OF 16 ARSENICAL DERMATITIS PATIENTS RECEIVING BAL THERAPY

Time Period	Mgm As/liter Urine (average)
1st noon	0.49
1st midnight	0.93
2nd noon	0.84
2nd midnight	0.89
3rd noon	0.77
3rd midnight	0.79
4th noon	0.55
4th midnight	0.44
5th noon	0.40
5th midnight	0.38
6th noon	0.32
6th midnight	0.30

In the first three days covered by this graph there is a slight indication of diurnal variation in arsenic excretion but it is entirely too small to justify any definite statement.

Only one individual was studied to whom no BAL was given. His urinary arsenic values are shown in Table IV. This individual was exposed to arsenic trioxide dust during the course of his work and developed an acute dermatitis. He did not wear his respirator too faithfully and some dust was absorbed by inhalation. Hospitalization was suggested while the dermatitis was being treated but BAL therapy was refused. The urinary arsenic values, then, show the rate of arsenic excretion when no BAL is administered.

TABLE IV.
URINARY ARSENIC EXCRETION IN ONE PATIENT RECEIVING NO MEDICATION

Time Period	Mgm As/liter Urine
First Day	
Noon	3.15
6:00 PM	5.76
Midnight	5.30
Second Day	
6:00 AM	5.25
Noon	4.32

Before further studies could be done the patient insisted on leaving the hospital, stating he felt completely well.

One man was studied who had had acute arsenical dermatitis 22 years previously. After a short period of exposure (several days) to arsenic trioxide dust, during the period of this study, he developed a marked facial dermatitis. BAL was administered every six hours and his excretion of urinary arsenic followed. During the four-day period of study his urinary arsenic value averaged 0.20 mgm As/liter. It was thought this case was on an allergic basis as described by Holmquist[4] and showed arsenical dermatitis can develop even with urinary evidence of low arsenic content in the body.

RELATIONSHIP OF SMOKING TO URINARY ARSENIC VALUE: Several investigators have shown tobacco contains varying amounts of arsenic. Thomas and Collier[10] studied the volatilization of arsenic when tobacco is being smoked and found the concentration of arsenious oxide in puffed cigarette smoke ranged from 3.3 to 10.5 mgm per cu. meter.

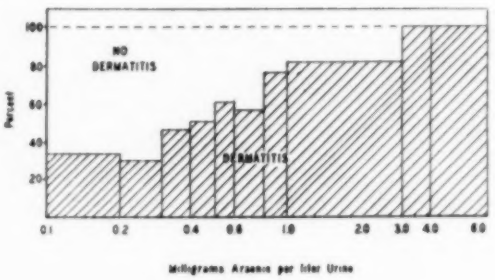

Fig. 4.
Percent of individuals in various urinary arsenic level ranges who developed dermatitis.

Webster[9] was unable to find any evidence that the use of tobacco affected the concentration of arsenic in the urine of 46 people he studied.

In our study a comparison of the urinary arsenic values among control subjects was made in relation to the smoking habits of the individual. The comparison is shown in Table V.

TABLE V.
COMPARISON OF URINARY ARSENIC VALUES OF NORMAL INDIVIDUALS WITH THEIR CIGARETTE SMOKING HABITS

Smoking Habit	Number of Individuals	Urinary Arsenic Mgm/liter
No smoking	13	.12
10 Cigarettes daily	4	.07
20 Cigarettes daily	16	.08
30 Cigarettes daily	1	.05

It is evident that cigarette smoking does not augment the excretory level of arsenic in the urine.

Principal Effects of Arsenic Trioxide Exposure

DERMATITIS: Holmquist[4] has made by far the most extensive and careful study of dermatitis among industrial workers exposed to arsenic trioxide as well as to the numerous substances found as contaminants of the crude dust. His studies show that only the arsenic trioxide is responsible for the dermatitis which develops. It is also his conclusion that arsenic compounds may produce four main types of reactions, i.e., toxic, eczematous, combined toxic-eczematous, and reactions characterized by follicular lesions.

Dermatitis is by far the most common lesion found among industrial workers exposed to arsenic compounds. There is no definite value of urinary arsenic above which all individuals will develop dermatitis and below which no dermatitis appears. This is to be expected from the various ways in which arsenic acts as an etiological agent in producing dermatitis. In Fig. 4 the percent of individuals in various urinary arsenic level ranges who did or did not develop dermatitis are shown. This study was made on 127 individuals.

PERFORATED NASAL SEPTA: Dunlap[6] first described accurately the perforation of the nasal septum which can occur among industrial workers exposed to arsenic trioxide dust as flue dust,

and the probable mechanism for producing such perforations in normal nasal cavities has been described above. Deviation of the nasal septum or variations of intranasal anatomy which produce partial obstruction of the air passages change the airflow characteristics through the nose. In our experience individuals with such anatomical variations are more likely to develop trouble than those with normal nasal passages.

The development of the septal perforation is practically painless and may occur in as short a time as a week. On the other hand, men have worked for years without developing a perforation by using faithfully a simple respirator. Once the perforation has been produced, there is no further extension of the erosion. Since only the middle part of the cartilaginous septum is involved, no deformity of the nose is produced. The saddle-nose of syphilis and the infrequent postoperative septal defect after nasal operations can readily be differentiated from the perforation due to arsenic dust. No disability or objectionable sequelae follow development of the perforation due to As_2O_3.

TURBINATE INFLAMMATION AND PHARYNGITIS: As has been indicated, the primary effect of arsenic trioxide dust exposure in industry is on surfaces of the body which come in contact with the dust. Sometimes in heavy dust exposure and with careless use of respiratory protection an individual may have irritation of the nasal turbinates and pharynx. In our experience such irritation is uncommon. It is essential that preexisting anatomic abnormalities or disease of the turbinates or pharynx be recognized and such individuals be kept from arsenic dust exposure until the condition is cleared.

CONJUNCTIVITIS: Dermatitis of the face and eyelids is sometimes complicated by conjunctivitis and the eye irritation is rarely found alone. It is a chemical conjunctivitis characterized by redness, swelling and pain. The ordinary methods of treatment are not very effective but excellent results are obtained by the use of Cortisone or BAL. Details of such treatment are discussed with other measures under "Therapy."

OTHER CONSIDERATIONS: Previous reports of arsenic trioxide exposure in industry have noted the rarity of systemic poisoning.[12] In our study we have seen only one doubtful case which may have been attributed to arsenic dust inhalation. This case had symptoms of a gastro-enteritis lasting about 24 hours.

Arsenical pigmentation and keratoses are also mentioned frequently in the literature (Hamilton,[12] Kober and Hanson,[13] Osborne,[14] Hamilton and Hardy[15]). Under the conditions of arsenic trioxide exposure we have seen, neither excessive pigmentation nor keratoses were produced. Some of our patients have worked with arsenic trioxide for 30 years.

Occasionally a garlic odor of the breath has been attributed to arsenic trioxide.[16] We have never noted this odor when workers handle pure arsenic trioxide. Contamination of the material with even traces of tellurium, however, will cause a garlic odor of the breath to develop in many individuals. It is possible that early smelting practices did not remove tellurium from the As_2O_3 as completely as is done today.

Therapy

THE cases of dermatitis seen have shown lesions which are both morphologically and clinically similar to those produced by exposure to contact with allergic or primary irritants. Use of the protective equipment (clothing), previously described, quite definitely limits the areas of exposed skin to which protective and local curative medications need be applied.

It has been found practical to use a soothing ointment of fairly high melting point on the nasal membranes. The one with greatest worker acceptance is a cod liver oil in vaseline base which is applied by clean finger or cotton applicator at the beginning of work periods and whenever hands are washed during shifts. Regular use of "shake-lotions," especially calamine with 2% phenol, has proved to be of value because it is easily applied with a cotton sponge and washes off readily at end of shift. Some men seem to prefer zinc oxide powder dusted on dry skin at beginning of work periods. In both cases the protective action seems to be mainly mechanical. Special protective ointments have not been very successful.

The therapy of severe erythematous, bullous, and follicular lesions has become fairly standard. In all hospitalized cases the response has been as satisfactory as it is in any of the acute contact types of industrial dermatoses. Because of the variable allergic nature of these conditions the regime is empirically oriented to the focal symptoms. This includes: (a) cold boric acid compresses for the edema of eyelids, pinnae, and face; (b) intensive antihistamine therapy (Perazil® 50 mgm b.i.d. or Histadyl® 50 mgm q.i.d.); (c) 1 gram of sodium thiosulfate intravenously daily; (d) high doses of cevitamic acid —up to 2000 mgm daily by mouth; and (e) specific use of BAL in recommended dosage. For the average size workman this is about 1.5 to 1.6 cc. of the oily solution every six hours by deep intramuscular injection. The rapid improvement of objective skin irritations and the relief of itching, and other subjective symptoms make this a specific therapy. However, the first few injections may be quite painful and may result in systemic reactions of mild shock. This has been prevented or mitigated by routine hypodermic use of 0.3 cc. of 1-1000 aqueous Epinephrine immediately preceding the BAL. Because of this reaction all patients are hospitalized during initial stages of therapy. Care must be taken to use BAL intramuscularly. In one hospitalized case one dose inadvertently given over the sciatic nerve produced a neuritis that persisted for several months.

After the acute phase is passed, the patient may be treated on an ambulatory basis, continuing BAL in one daily dose for several days. During the terminal phase of healing, the epidermis over irritated areas usually exfoliates, leaving a dry-scaling, slightly pigmented area which heals without scars. Lanolin ointments are helpful in this stage.

The dramatic results of Cortisone in therapy of allergic conditions suggests that it may be effective here. It was used in one case of moderate severity but results were not entirely satisfactory. Later developments in this case established a diagnosis of non-occupational neurodermatitis which may account for this apparent failure.

The therapeutic benefits of elimination of exposure to the primary irritant cannot be minimized and must be credited with some of the rapid healing. Workmen are encouraged to present themselves for therapy at the earliest development of irritation. This is generally found to be a folliculitis of the sebaceous areas, especially at the naso-labial fold, cleft of chin, and pressure areas where clothing, hats, or respirators rub the skin. A few have been primary in the gluteal and scrotal areas where poor personal hygiene has been practiced. In all these mild cases, an ointment of 20% sodium thiosulfate in lanolin has given satisfactory results. These workmen are removed from exposure promptly if this palliative protective measure is not successful.

Therapy of the irritated nasal mucous membranes is less successful. If protective ointments are not being used they are started. The development of an acute or chronic rhinitis makes these applications difficult, and continued nose-blowing or wiping also increases chances of dust exposures. Where early ischemia and pallor of mucous membranes are seen, regular applications of 5% silver nitrate solution have been tried, along with specific therapy to relieve the rhinitis. BAL has a very disagreeable odor so that its topical use in the nose is impractical. Persons with marked allergic rhinitis or a deformed nasal septum should be removed from exposure.

An occasional case of acute chemical conjunctivitis is seen. Such cases are somewhat more resistant to treatment. However, the use of Cortisone acetate 1.5% ophthalmic ointment has been encouraging. BAL intramuscularly is also quite effective. The use of hydrosulphol in castor oil has not proved to be of especial value, and causes some local irritation and stinging which makes it objectionable.

Comment

IRVINE and Turnacliff[17] state, ". . . . arsenic is found in the urine in variable amounts" and ". . . . urinary findings in a group, most of whom had not been reported to us for clinical symptoms, seem to indicate that even large amounts can be present without giving rise to cutaneous or subjective symptoms." The figures for urinary arsenic levels we have reported indicate that much more arsenic can go through the human body without causing sickness than has heretofore been realized. Even with urinary arsenic levels of 4 or 5 mgm/liter we have seen only one doubtful case of systemic sickness.

The relationship of urinary arsenic levels to determatitis is more obscure. Holmquist's postulation that most arsenical dermatitis eventually is on an allergic basis fits well with the facts we have observed. A number of the individuals whom we studied showed dermatitis while their urinary arsenic levels were within the range found among control subjects. We feel their dermatitis developed when arsenic trioxide dust came in contact with a hypersensitive skin which was moist enough to cause As_2O_3 dust to adhere. Holmquist[4] also found the incidence of arsenical dermatitis was higher when work conditions were conducive to sweating. During other periods when these individuals were not exposed to arsenic dust, a normal amount of arsenic was found in their urines but this did not cause skin reactions. The problem, then, in industry is to prevent contact of the skin with arsenic-containing dust and thus prevent dermatitis.

Air analyses for arsenic trioxide dust are of value to engineers in evaluating the effectiveness of dust control measures. However, the use of dust-in-air concentrations is of limited value in predicting how frequently and how extensively skin reactions may occur. Individuals whose skins are highly sensitized to arsenic dust will react to surprisingly small amounts of the material—amounts which do not affect the normal individual. A practical value is one which corresponds to a urinary arsenic level of between 2 and 3 mgm/liter when the workers wear, with reasonable faithfulness, the protection which we have described. We have seen this protective clothing worn in a semi-tropical climate under conditions of heavy dust exposure by 12 men for seven years without the development of a perforated septum or disabling dermatitis. Constant and intelligent supervision is a prerequisite for such a program.

By themselves, urinary arsenic values cannot be taken as a specific finding from which a diagnosis of disease can be made. The urinary arsenic value shows a certain amount of arsenic has gone through the body but it does not show what effect that arsenic has had on the body. Diagnosis of disease can only be made from a careful evaluation of history and physical examination in association with the laboratory findings. People who work with arsenic trioxide will have the usual diseases which will be found in any adult population and the finding of a urinary arsenic value of 4 or 5 mgm/liter of urine does not automatically mean arsenic is the cause of the pathological condition. In our study we have not found a urinary arsenic level which was consistent with systemic disease since the incidence of possible systemic disease was so extremely low.

This study also brings to attention the necessity of determining from what possible compound a toxic metal found in the urine is derived.

If two urine samples show equal quantities of arsenic but in one case the arsenic came from the inhalation of As_2O_3 dust while in the other it came from the inhalation of arsine gas (which is very poisonous) the toxic states of the two individuals would be widely different.[18] In the ordinary laboratory analysis, all heavy metals are reduced to the inorganic state before analysis. Consequently, no differentiation by means of urinalysis could ordinarily be made between arsenic derived from As_2O_3 dust and from such highly toxic arsenical organic compounds as lewisite (dichlorobetachlorovinylarsine).

Conclusions

1. IN A MODERN smelter, the deleterious effects of exposure to arsenic trioxide dust are shown principally by irritation of body surfaces exposed to direct contact with the dust. These surfaces include the exposed skin, conjunctivae, and mucous membranes of the nose.

2. Systemic poisoning by inhalation of arsenic trioxide dust alone is rare.

3. The average urinary arsenic value found in 147 determinations made on 124 normal individuals not exposed to arsenic trioxide dust was 0.13 mgm/liter.

4. Eight hundred thirty-five urinary arsenic determinations were done on 348 men exposed to arsenic trioxide dust. The urinary arsenic values ranged from 0.10 to 6.44 mgm arsenic/liter of urine. Ninety-five percent of the exposed group had less than 2.1 mgm arsenic/liter of urine. The average urinary arsenic excretion value for the entire group was 0.82 mgm/liter of urine.

5. In 16 individuals, urinary arsenic determinations were made on each sample of urine passed for periods of two to five days. Each individual had been exposed to inhalation of arsenic trioxide and was receiving dimercaptopropanol (BAL) therapeutically for dermatitis. The rate of arsenic excretion was found to be 0.7 mgm arsenic per 24-hour period.

6. Moderate cigarette smoking does not increase the amount of arsenic found in urine.

7. In this study we did not find a urinary arsenic level consistent with disease.

8. These data indicate much more arsenic can go through the human body without causing sickness than has heretofore been realized.

[NOTE: The arsenic analyses on which this paper is based were made by Mr. K. W. Nelson and Dr. G. S. Winn. To them we wish to express our sincerest appreciation.]

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Retirement

THE ONE kind of retirement that appeals to everybody is that which crowns a career, closes a record of service and a long roll of things done, and comes in life's late afternoon while the sun still beams upon the perspective and the air has only the faintest suggestion of the cool, long reaches of the night that soon "shall shape and shadow overflow." Every man has the hope that his own retirement will be that kind. Inarticulate in the main, and modified by the place and circumstances of the one who holds it, this hope is, nevertheless, the genesis of all the pension systems that are, and the will-o-the-wisp of most of the "social security" that can never be. The man who sees it at hand for himself, therefore, is fortunate. He will continue to be fortunate in accordance with what he does with it. —*Indust. Med. & Surg.*, 5:4, 193 (April) 1936.

The Present Status of Antibiotic Therapy

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AN ATTEMPT to review the subject of the antibiotics and their use in medicine is a formidable undertaking. The very volume of the literature on this subject invites us to agree with Lord Pulvertaft, who said (*Lancet*, 263:839 (November) 1952) "We might lament the flood of information that presently inspissates the ether and reduces entire forests to wood pulp and dismay." If there were no exceptions to the myraid claims made for the various antibiotics, bacterial diseases would be at an end. Daily experience, however, demonstrates that this happy moment has not yet arrived, regardless of the profound effects these agents have had upon mortality statistics.

Despite the impossibility of reviewing the entire subject, an effort has been made to delineate certain broad principles and to make certain generalizations that can, in some measure, serve as a practical guide in the majority of situations.

Relative Importance of Chemotherapeutic Agents

UNDER the influence of high pressure promotional efforts to popularize each new antibiotic, it is easy to lose one's perspective with regard to the relative importance of the various chemotherapeutic agents. In Fig. 1 are presented the production figures for the sulfonamides and the various antibiotics as released by the United States Tariff Commission. At the present rates of production, sulfonamide drugs are produced in amounts 10 times that of the most abundantly produced antibiotic, penicillin; 6,000,000 pounds of sulfonamides versus 600,000 pounds of penicillin. The daily doses of the sulfonamide drugs are measured in grams, ranging from four to six or even eight to 12 grams in the case of the poorly absorbed sulfonamides, and this dose contrasts strikingly with the daily dose of penicillin which is, averagely speaking, about 300,000 units or 0.2 gm. Therefore, if these production figures are interpreted in terms of individual daily doses of the drugs, it can be stated that the sulfonamides are presently used as widely as penicillin. This fact is not commonly recognized. It is apparent also in Fig. 1, that the production of penicillin in terms of pounds, exceeds by two times the production of streptomycin and dihydrostreptomycin and approximately equals the combined production of the newer antibiotics, aureomycin, terramycin, chloramphenicol, neomycin, polymyxin and bacitracin. The pre-eminence of penicillin among the antibiotics is again evidenced by interpreting the above facts in terms of the daily doses. The average oral doses of aureomycin, terramycin, chloramphenicol and neomycin are measured in grams, whereas the daily effective dose of penicillin is, averagely speaking, 0.2 gm. Thus, the sulfonamide drugs and penicillin completely dominate the chemotherapeutic picture, and the extravagant use of both the sulfonamides and penicillin only serves to increase the evidences of effectiveness and safety.

The Antimicrobial Era

IT IS probable that history will record the 20 years between 1932 and 1952 as the antimicrobial era. Certainly, this period has been distinguished by the emergence of a host of antimicrobial drugs from which a relatively few have survived as useful therapeutic agents. One is occasionally overwhelmed by the futility of trying to keep up with the literature on these multiple agents, and the feeling of frustration contributes to a lack of proper appreciation of the unequal lengths of time that the agents have been available for intensive study. The enormous volume of the literature pertaining to these antimicrobial drugs is a reflection of their "newness" and their unsettled places in therapy. We might liken these agents to adolescent giants vying with one another for laurels in the therapeutic arena.

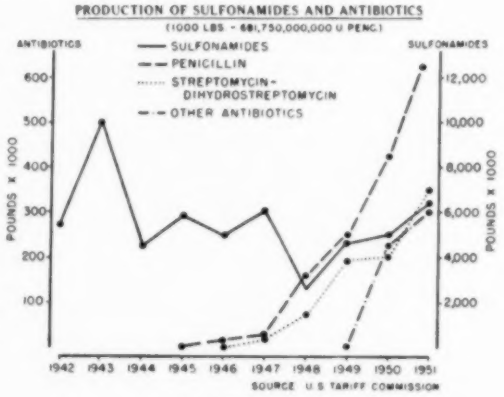

Fig. 1.

Presented at the American Mutual Liability Insurance Company Seminar on Industrial Medicine and Surgery, Philadelphia, December 10, 1952.

Fig. 2.

In Fig. 2 it may be seen that sulfanilamide was the first-born of the great family of sulfonamides, and it is interesting that it had the longest gestation of all—from 1908 when it was a mere dye until 1932 when it was "rediscovered" as a drug. Two brothers, sulfapyridine and sulfathiazole, enjoyed short lives and have been virtually forgotten. The more recent sulfonamide progeny, the sulfapyrimidines (sulfamerazine, sulfamethazine and sulfadiazine), 'Elkosin' and 'Gantrisin' are widely accepted and give good evidence of the vigor of the sulfa family.

Similarly, penicillin laid in the womb of scientific time for a considerable period—a laboratory culture in 1928, a crude drug in 1940—and presently the pre-eminent antibiotic. It is a point worth mentioning that penicillin is one of the few good things that came out of World War II. Under the necessity of producing the drug for the care of infections and diseases in the Army, the development of penicillin went ahead without concern for expense or selfish interests; the results were brilliant! In the brief period from 1944 to 1952, literally hundreds of antibiotics have been isolated but few have survived the single criterion of safety for use in man. The exceptions have been chloramphenicol, aureomycin, terramycin and streptomycin, and, to lesser degrees, neomycin and bacitracin. New developments can be anticipated momentarily, and the most recent additions to the number of useful antibiotic agents are erythromycin and magnamycin. Our need for powerful drugs with narrow but specific activities will probably increase. In this connection, erythromycin and magnamycin will probably have their greatest usefulness in treating organisms that are either natively resistant or have become penicillin-resistant.

The Bacterial Milieu

THE concept of Claude Bernard's "milieu interieur" has become familiar to all and specifically in terms of electrolyte balance. In the same manner, man lives in a "bacterial milieu." Man carries in his mouth streptococci, pneumococci, fusiform bacilli, and various strains of Neisseria; in the gut are colon bacilli and various anaerobes; on the genitalia are acid-fast smegma bacilli; in the vagina the Doderlein's bacillus; and on the skin is an ever-changing population of pathogenic and saprophytic organisms. The host of microorganisms that surround us is made up of friends and enemies. Some of the enemies are powerful enough to cause disease if they band together even in small numbers; others of the organisms, although not ordinarily pathogenic for man, can be gathered together in such numbers as to cause disease. Examples of the microorganisms that are frankly favorable to us and, indeed, make life possible, are the nitrogen fixing bacteria and the organisms that produce vitamin B_{12}. It can be said with considerable truth that "we live in spite of and on account of microorganisms," and the "bacterial milieu" is just as important to us as the "milieu interieur." When the normal balance of this bacterial environment is upset, disease results.

Today we have a multiplicity of chemotherapeutic agents. There is an increasing opportunity for making the choice of treating rather specifically the particular microorganisms causing infection with a "narrow spectrum agent" or using a "broad spectrum agent" that is effective against a number of organisms. At the present time neither of these objectives is attainable in full measure for (a) no drug is so narrowly active as to influence one organism and no other and (b) none of the broad spectrum antibiotics approaches being an "omnicidin" or a "killer of everything." At times we might think that it would be the ideal chemotherapy to have an agent that would "sterilize" a patient from the standpoint of his bacterial milieu, but it is perhaps fortunate that no such agent is available. If a compound were capable of killing all bacteria and were produced in the quantities that have been indicated for penicillin and sulfonamides (Fig. 1), we would sincerely hope that this agent would be unstable when it passed from the body or its effects upon the bacteria in the world might be so profound as to threaten life itself. It is doubtful whether Nature will yield to us such a self-destructive weapon as an "omnicidin" or "omnimycin."

Although we are presently limited to "relatively" specific antibiotics in aiming at particular diseases, our objective in therapy should be that which Ehrlich voiced in 1908, "We must learn to aim, learn to aim with chemical substances."

New Diseases Caused by Chemotherapy

THE objective of good therapy should be the wiping out of infecting microorganisms as completely as possible with as little influence upon the other organisms in the bacterial milieu as possible. Excessive upsetting of the normal balance amongst organisms may "create" new problems of infection. In Table I are recorded a few examples of "new infections" that have

TABLE I.
"INFECTIONS" INITIATED BY ANTIBIOTIC THERAPY
(INCOMPLETE LIST)

Infection Treated	Agent	Infection Resulting
Influenzal Pneumonia	SM	Streptococcal Infections
Influenzal Pneumonia	SM	Staph. Aureus Septicemia
Streptococcal Sore Throat	P	E. Coli Stomatitis
Pertussis	AM, TM	'Scarlet Fever' Due to Hemolytic Staph. Aureus
Salmonella Infection	AM, TM	Staph. Aureus Dysentery
Urinary Tract Infection	TM	Staph. Aureus Urinary Infection
Urinary Tract Infection	AM	Proteus Vulgaris
Pneumococcal Pneumonia	P	H. Influenzae in Sputum
Pneumococcal Pneumonia	P	E. Coli Pneumonia
Chronic Skin Lesions	NM	C. Albicans
Skin Infections	BACITRACIN	PS. Aeruginosa and Proteus Vulgaris
Respiratory Infections	CM, AM, TM	C. Albicans

been created during the therapy of established diseases. The implication of these recorded observations can be extended to a consideration of the potentials in connection with the prophylactic use of chemotherapeutic agents.

Dr. Maxwell Finland (*Bull. N.Y. Acad. Med.*, 27:199 (April) 1951) pokes fun at the idea of "womb to tomb" prophylaxis and perhaps this humorous way of making a criticism renders the hard truth more palatable. Without any desire to dampen the laudable enthusiasm for the prevention of disease, I personally believe that the prophylactic uses of antibiotics have been extended far beyond the indications or the proofs of effectiveness. If we are honest with ourselves it must be admitted that many physicians are being stampeded into the rather reckless and indefensible use of antibiotics by the importunities of the patient or his family. There is little or no justification for using antibiotics for the treatment of the common cold and yet this practice is prevalent. If one can persuade himself that everyone with the sniffles should be given prophylactic treatment with antibiotics, it is an easy transition to weekly or daily injections during the winter, or perhaps better yet "the implantation of antibiotic pellets." Certainly, the over-justification of prophylactic use of these valuable agents plays into the hands of the unscrupulous who are more interested in a fee than in the practice of excellent medicine, and who are more skillful with a needle and syringe than they are in making diagnoses. It might be different if we had agents that were cheap and completely harmless, but we are well reminded that Nature will not be denied, she possesses the means of circumventing any hindrance that arises in the cycling of living things. Clinical experience has shown that when an agent is employed that kills gram-positive organisms, the gram-negative ones flourish, and *vice versa*. Nature abhors a vacuum at the microbial level as well as other spheres.

Moniliasis has probably attracted as much attention as any thing else in connection with "an overgrowth phenomenon." The occasional occurrence of thrush in the mouths of children or in the vaginas of pregnant women is familiar to all of us. In years past C. albicans has been isolated from the lungs, sputum or feces but no pathogenic role was assigned to the organism; indeed, the finding was frequently dismissed as an error in the bacteriologic laboratory, but experience with the antibiotics has forced us to reckon with the basic concept that when the natural bacterial inhibitors are eliminated, C. albicans may overgrow. Perhaps, even currently the overgrowth of monilia is being over-emphasized and Kilgman (*J.A.M.A.*, 149:971 (July) 1952) has recently taken this point of view. Nevertheless, some examples of monilial overgrowth in connection with antibiotic therapy have been observed and we must be alert to the potential of this organism becoming pathogenic.

Although the "new infections" that are listed in Table I arose during therapy, the likelihood of similar happenings following the prophylactic use of drugs is real. Prolongation of antimicrobial therapy beyond necessity probably favors excessive disturbances of the bacterial milieu, but the patient's age, state of nutrition and disease may contribute to the likelihood of a superimposed infection developing. It should not be inferred that overgrowth of the organisms of the conditions listed in the right-hand column of Table I, will occur in all cases or even in a majority of those treated with the agents cited, but it is happening sufficiently frequently that we must look ahead to the problems that await us. Indiscriminate use of antibiotics can only hasten the moment when we must deal with these problems.

It is acknowledged that the number of "penicillin-resistant" staphylococci has increased significantly and as many as 68% of newly isolated strains are reported to be resistant. Aureomycin and terramycin were originally heralded as an answer to the problem of staphylococcal infections and both are useful in the treatment of some strains of penicillin-resistant staphylococci. Nature, not to be denied, has developed organisms resistant to each of these antibiotics. The dysentery and scarlet fever due to staphylococci during treatment are definitive evidence of the gravity of "super-imposed infections."

Urinary tract infections due to E. coli are common and are usually amenable to treatment with aureomycin, but within seven to 10 days E. coli infection is replaced by one due to P. vulgaris. When therapy is discontinued, the infection reverts to one caused by E. coli. We have followed some of our diabetic patients through three and five cycles of alternation between E. coli and P. vulgaris. It is axiomatic that urinary tract infections cannot be cured in the presence of stasis due to physical defect. Antibiotics are a partial answer, but in general, far too much confidence is placed in the chemotherapeutic approach to the problem of urinary infections. The urine can be cleared for a few days but pools of stagnant urine will allow the development of

TABLE II.
SIMPLIFIED CHEMOTHERAPY

Drug	Average Dosage Schedules GM./Day	Days
Sulfonamides	4-6 + Urine Output 2000 cc.	7-10
Penicillin	0.18-0.6 (300,000-1,000,000 units)	5-7
Streptomycin	1-4	5-10 (A)
Aureomycin	1-2	5-10
Terramycin	1-2	5-10
Chloramphenicol	1-8	7-21
Bacitracin	40,000-150,000 units	—(B)
Neomycin	1-10	—(B)
Polymyxin	0.2-0.5	—(B)
Erythromycin	0.4-4	—(C)

(A) Exclusive of Tuberculosis (C) Uses Not Well-Defined
(B) Specialized and Restricted Uses—Toxic Drug

organisms resistant to the therapy in progress and relapse will follow.

Our chemotherapeutic agents are powerful antimicrobial drugs that are dramatically effective in many conditions, but as a broad biologic principle, it should be remembered that during therapy they strike not only at the organism causing the infection but exert a general effect upon the "bacterial milieu" of man so that natural inhibitors of potentially pathogenic organisms are suppressed and the uninhibited organisms may overgrow and produce new and unexpected diseases. The phenomenon of superimposed infection is not common as yet, but the evidence in hand warrants our looking into the future and invites us to curb overzealous application of antibiotic therapy.

Average Doses of Chemotherapeutic Agents

FOR all of the diffuseness of the medical literature on antibiotics, it is possible to make some reasonably accurate general statements. Admitting that all "average" figures represent a certain degree of artificiality, it is nevertheless possible to present average daily doses for the presently available chemotherapeutic agents (Table II) that are effective for the majority of the conditions in which these agents produce favorable results. Refinement of dosage schedules has limited significance for the pharmacology of the agents is such that the manner in which the daily dose is divided and administered is relatively unimportant. Side effects or toxicity set the limits of the daily doses within narrow limits for all of the agents except penicillin.

The maintenance of a urinary output of 2000 cc. per day during sulfonamide therapy is important, but alkalinization is probably unnecessary since the availability of sulfonamide combinations for oral administration has reduced the problem of urinary concentrations almost to the vanishing point. Penicillin in a dose of 300,000 to 1,000,000 units (0.2 to 0.6 gm.) permits the treatment of 80 to 90% of penicillin susceptible infections and it is immaterial whether this dose be administered parenterally or by mouth. It is worth recalling that when penicillin first became available, the National Research Council approved the use of as little as 5,000 units of penicillin intramuscularly every three hours for the treatment of lobar pneumonia. We have personally satisfied ourselves as recently as 1951 that this regimen is adequate but we would not suggest wide use of such a schedule of therapy now that penicillin is so plentiful and so reasonably priced. As physicians, we are mandated to favor our patients' welfare, and overtreatment rather than the contrary is defensible. Actually, 300,000 units intramuscularly is overtreatment for many common infections.

By reason of its astounding non-toxicity, penicillin dosage may range from 1,000,000 to as much as 100,000,000 units (60 gm.) per day. This latitude of dosage permits the treatment of many infections that are regarded as "penicillin-resistant." Resistance is a relative term and even in a short period we have seen the term re-defined several times, first as an organism requiring more than 0.1 unit/ml, then 0.5 to 1 unit/ml and currently as organisms requiring 5 to 25 units/ml. Infections due to organisms resistant to 10, 25 and even 50 units/ml *in vitro* have been successfully treated by using "more penicillin" or penicillin in conjunction with probenecid ('Benemid').

Even in the recommended doses of 1 to 2 gm. per day, aureomycin and terramycin produce side effects in the form of nausea, vomiting and diarrhea. Intravenous doses as small as 500 mg., if administered too rapidly, can produce fever, nausea, vomiting, and even convulsions. Indeed it has been reported recently that debilitated patients suffering from malignant diseases, died following the administration of several grams of aureomycin and terramycin intravenously. It must not be forgotten that these agents are powerful pharmacologic agents and our understandings of them are limited. Too much of anything, even if it is a good drug, can be harmful. It should be emphasized that intravenously administered aureomycin and terramycin should be given slowly (30 to 60 minutes) and the dose should be diluted in 200 to 300 cc. of saline or 5% glucose.

Bacitracin is quite toxic when administered parenterally, but it has specific usefulness in combination with penicillin for the treatment of some penicillin-resistant strains of organisms. Even in an amount as small as 75,000 units per day, it can be nephrotoxic. Bacitracin is used most widely as a locally applied antibacterial agent.

Neomycin has special uses and is presently most widely employed as a topical medication. When administered orally in doses up to 10 gm. per day, it is useful for gastrointestinal bacteriostasis. It is minimally absorbed from the gastrointestinal tract and hence, is non-toxic when administered orally. Neomycin in some selected cases can be substituted for streptomycin in the treatment of tuberculosis, but this need is ex-

tremely limited. Sensitization to neomycin has been less frequent than was originally anticipated.

The parenteral dose of polymyxin is very small, 2 to 4 mg/kg body weight per day and in these doses it may be resorted to for the treatment of refractory urinary tract infections, but even in these doses it may have some toxicity for the renal tubule. There are times when we are willing to pit the patient's physiologic reserves against the toxicity of the drug in the hope of gaining a therapeutic result. For the treatment of Ps. aeruginosa (pyocyanea) meningitis, polymyxin is as near to being as specific as we have for this disease. In considering this infection, which is a very serious one, we should recall that almost all of the cases are assignable to diagnostic spinal taps or spinal anesthesia. A space as vulnerable to infection as the subarachnoid space should not be invaded without good reason.

Erythromycin ('Ilotycin') and Magnamycin are new and hence the doses and uses are not fully defined.

More Penicillin versus Penicillin and Probenecid

AS PREVIOUSLY referred to, the nontoxicity of penicillin permits great latitude of dosage so that many so-called "penicillin-resistant" infections are amenable to proper attack. Subject to economic consideration, penicillin dosage can be increased to as much as 100,000,000 units (60 gm.) a day. When the daily dose of penicillin exceeds 8,000,000 to 12,000,000 units, the intravenous route of administration should be resorted to. Despite the extreme solubility of sodium and potassium penicillin, when doses larger than 1,000,000 units are administered, they are accompanied by considerable local stinging and irritation. When large doses of procaine penicillin are administered, the procaine lessens the pain, but the mass crystals of penicillin set up a certain amount of irritation. Indwelling plastic catheters make intravenous administration of penicillin and other drugs both convenient and comfortable for the patient.

Procaine penicillin revolutionized penicillin therapy by retarding the rate of absorption from the site of injection so that a given amount of penicillin was slowly released in the blood stream and exerted prolonged effects. A similar attack has been made at the kidney level where penicillin is secreted at a tremendously rapid rate. With pharmacologically active agents, notably probenecid, it has been possible completely to inhibit the tubular secretion of penicillin with resulting two- to tenfold increasing of plasma concentrations resulting from any given dose. The extension of penicillin therapy by this means constitutes almost "another therapy" of resistant infections.

In Fig. 3 are presented data derived from the same patients used as their own controls during four phases of study, and it is clear that at the end of one hour the same levels of penicillin in

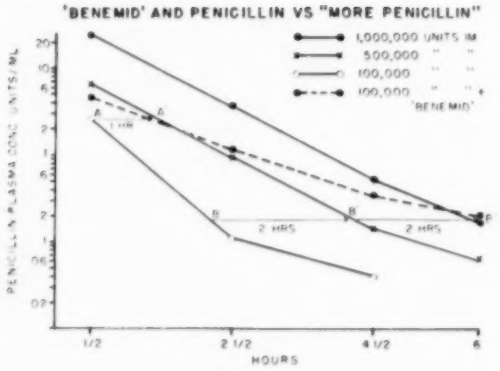

Fig. 3.

the plasma were achieved by administering 100,000 units of penicillin intramuscularly in conjunction with oral probenecid or by administering 500,000 units of penicillin alone. Similarly, at six hours the same concentration is achieved by 100,000 units of intramuscular penicillin in conjunction with probenecid and 1,000,000 units of penicillin alone. On the basis of these observations, the statement is made that probenecid is capable of increasing two- to tenfold the plasma concentrations derived from a given dose of penicillin. The same therapeutic results can be obtained either by administering "more penicillin" or administering penicillin in a lesser dose in combination with probenecid. When the daily dose of penicillin exceeds 1,000,000 units per day, the use of probenecid is justified, from both the economic and therapeutic standpoints.

In our own minds, probenecid is regarded as definitely indicated for the therapy of difficult cases of subacute bacterial endocarditis and we use the drug routinely in the handling of our cases. It is a pleasure to report that at Emory University, Atlanta, Georgia, some cases of subacute bacterial endocarditis due to resistant staphylococci have been treated with as much as 100,000,000 units of penicillin per day in conjunction with probenecid for periods up to four and five weeks. Some patients have been salvaged for whom no hope was entertained prior to the institution of therapy.

Choices of Agent for Therapy

THE daily doses of the various antibiotics having been "averagely" defined, a similar attempt has been made to indicate choices of therapy for the majority of commonly occurring infections. The attempt was made in recognition of the fact that treatment must be instituted all too frequently on the basis of clinical diagnoses and without benefit of laboratory guidance. Indeed, if laboratory assistance is awaited, the hour of decision has long since past. General recommendations can be made with reasonable assurance that good results will follow if the proper diagnosis has been arrived at by appropriate clinical skill.

TABLE III.
CHOICES OF CHEMOTHERAPEUTIC AGENTS
(SUBJECT TO INTERPRETATION)

Disease or Organism	Primary	Secondary	Tertiary	Also
Pneumonia	P	AM, TM	Sulfa	CM
Pneum. Meningitis	P* + Sulfa	AM, TM	Sulfa	
Pertussis	AM, TM	CM		
Streptococcus, Alpha and Beta Hemolytic	P	AM, TM	Sulfa	
Staphylococcus	P*	AM, TM	Sulfa	SM
Strep. Faecalis	P*	AM, TM	Sulfa	
Meningococcal Infections	P* + Sulfa	AM, TM	CM	
Gonococcus	P	AM, TM	SM	CM
Tularemia	SM	AM, TM	CM	
Plague	SM	AM, TM	CM	Sulfa
H. Influenzae	CM	SM + Sulfa	AM, TM	
Typhoid Fever	CM	P*	AM, TM	
Tuberculosis	SM + PAS	SM + PAS + INH		
Klebs. Pneumoniae	AM, TM	SM + Sulfa	CM	
E. Coli	AM, TM	SM	Sulfa	CM
Ps. Aeruginosa	PM	AM, TM	SM + Sulfa	
Tetanus, Diphtheria	P + Antitoxin			
Anthrax	P	AM, TM	CM	SM
Shigellosis	Sulfa	Sulfa + SM	PM	AM, TM
Brucellosis	SM + AM	AM, TM	SM + Sulfa	
Proteus Vulgaris	CM	AM, TM	SM	Sulfa
Mixed: Surgical Inf. Urinary Inf.	P + SM	AM, TM	Sulfa	CM

P—Penicillin P*—Massive Penicillin Dosage with Probenecid
SM—Streptomycin AM—Aureomycin TM—Terramycin
CM—Chloramphenicol Sulfa—Sulfonamides PM—Polymyxin

In Table III, primary, secondary and tertiary therapies have been indicated. Chloramphenicol appears in the tertiary and "also ran" columns for one reason only. Until recently when attention was given to the development of aplastic anemia, chloramphenicol was definitely gaining in popularity over aureomycin and terramycin because of lesser gastrointestinal intolerance. In fairness to chloramphenicol, it must be said that many of the cases of aplastic anemia assigned to the drug will not stand scrutiny. However, there are cases which leave no doubt that the drug has caused aplastic anemia and hence, following the first law of the physician, "do no harm," we have no alternative but to place chloramphenicol in the category of drugs that can be defended only when it is without question the treatment of choice. This proviso limits its use at the present time almost entirely to the treatment of typhoid fever or perhaps the treatment of influenzal meningitis. Aureomycin and terramycin, for practical purposes, may be regarded as interchangeable. The major difference between them is that of chemical structure for the antimicrobial spectrum, the pharmacology, the doses, the side effects, and the cost are virtually the same. It seems appropriate to emphasize that aureomycin, terramycin, and chloramphenicol are not three different treatments. They represent essentially the same treatment under three names. Entirely too frequently patients are treated for a period of time with aureomycin, then with terramycin, and then with chloramphenicol under the misapprehension that different attacks have been made upon the infection. Valuable time is frequently lost in this manner.

Since it is a practical necessity to treat many patients without having benefit of laboratory diagnoses, it seems lacking in purpose to list in Table III the bacteriologic causes of disease and indicate the susceptibility of these organisms to the various antibiotics. It seemed more realistic to list some disease conditions by name and others in terms of the causative organism, depending upon which designation had greatest practical significance. The list of diseases is not complete, but it covers the majority of common infections. The indicated primary therapies will prove useful in the usual situation, but particular strains of each of the organisms listed may not conform to the suggested pattern of treatment and, under these circumstances, laboratory assistance is needful both for refined sensitivity testing and for guiding therapy in terms of the achieving of given plasma and tissue concentrations of the antibiotic agents.

Combinations of Chemotherapeutic Agents

DRUGS should be used as specifically as our knowledge permits and I am dedicated to that proposition and, hence, until future experience dictates clearly to the contrary, I think single drugs should be employed rather than combinations. Nevertheless, in dealing with problem situations and in search for better therapy, we are occasionally forced, even in ignorance, to combine drugs. We would all grant that the combining of drugs is directed towards getting people well, but combinations of agents may be either purposeful or haphazard. It disturbs me to pick up a medical journal and see that in actual fact some patients are receiving simultaneously sulfonamides, aureomycin, terramycin, chloramphenicol, penicillin and streptomycin—six agents at once! With all humility, and admitting that we all make mistakes, I would submit that such a combination of agents is haphazard and has nothing to offer in terms of positive therapy.

In approaching a discussion of combinations of chemotherapeutic drugs, we must admit that our ignorance is profound. Our experience at the clinical level is limited and we can only hope to gain knowledge by sincere endeavor to study each case thoroughly. Combinations of drugs are fully justified when we are dealing with a specific troublesome organism, that is, producing an infection resistant to the usual schedules of therapy. It is these infections that teach us that it is just as ridiculous to say that all staphylococci behave similarly or react favorably to a particular agent as it is to state that all of the Smith's are five feet and 10 inches tall and have red hair.

It is common practice to argue from the premise that "if a little is good, more is better." Following this dictum, it is similarly easy to subscribe to the thought that if one agent is good, two or even three, are better. Certainly, there are instances where this philosophy appears to be borne out in fact, but natural phenomena are not always so obvious, or simple. In the laboratory there has already been accumulated some

TABLE IV.
CHEMOTHERAPEUTIC COMBINATIONS
(INCOMPLETE LIST)

Penicillin	
+ Antitoxin	Diphtheria, Tetanus
+ Sulfas	M'GC. + Pne. Meningitis
+ SM.	Strep. Faecalis S.B.E., Mixed Infections
+ Probenecid	"Penicillin-Resistant" Staph. Aur. and Strep. Faecalis S.B.E., Typhoid Fever
+ Bacitracin	"Penicillin-Resistant" Staph. Aur.
+ TM.	Strep. Faecalis S.B.E.
+ AM.	Staph. Aur. S.B.E.
Streptomycin	
+ PAS	M. Tuberculosis
+ PAS + INH	M. Tuberculosis
+ Sulfas	Kleb. Pneumoniae
+ Sulfas	H. Influenzae Meningitis
+ Sulfas	Brucellosis
+ AM.	Brucellosis

evidence to indicate that the combination of active agents may result in simple additive, synergistic or antagonistic effects. In terms of a few strains of organisms, the phenomena of addition, synergy and antagonism have been demonstrated by *in vitro* test tube experiments and by studies of a limited number of infections in small laboratory animals. Indeed, there is some evidence that a combination of aureomycin and penicillin is less effective in the treatment of pneumococcal meningitis than is penicillin itself (Lepper, Jackson and Dowling, *Proceedings of the National Meeting of the American Federation for Clinical Research*, 1952). Although the evidence at the clinical level of antagonism between chemotherapeutic agents is meager, it seems wise to have the concept in mind and not to combine useful agents in haphazard fashion. Certainly, test tube experience has been valuable in terms of correlating bacterial sensitivity to effective dosage schedules and there is every likelihood that in this matter of antibiotic antagonism, the laboratory experiments are pointing the way toward future clinical developments.

Actual experience has seemed to demonstrate certain benefits arising from the combining of chemotherapeutic agents, and in Table IV appears a partial list of combinations that have seemed to be beneficial. The table is in large measure self-explanatory, but it does seem purposeful to comment on a few items.

The combination of antitoxin with any chemotherapeutic agent used for the treatment of exotoxic diseases is mandatory. No single antibiotic or combination of agents is a substitute for antitoxin in the treatment of diptheria, tetanus, and gas gangrene.

A combination of agents seems fully justified in the treatment of urinary tract and surgical infections for, in the main, these infections are due to a mixture of gram-positive and gram-negative microorganisms and a broader attack is needful than can be accomplished by the use of a single agent.

In treatment of pyogenic meningitites, meningococcal and pneumococcal, a combination of sulfonamides and penicillin is desirable. Some meningococci definitely do not respond to penicillin, but all are sensitive to the sulfonamides. And, although pneumococci respond satisfactorily to sulfonamides, penicillin is perhaps a little better. Since immediate bacteriologic diagnosis is frequently impossible, combined therapy with sulfonamides and penicillin is advisable.

The combination of chemotherapeutic agents has been particularly valuable in the treatment of resistant infections such as Streptococcus faecalis, subacute bacterial endocarditis, staphylococcal osteomyelitis, tuberculosis and brucellosis. Certainly, in the treatment of tuberculosis the combinations of streptomycin with PAS and more recently the combination of streptomycin with isonicotinic hydrazide (INH) are of tremendous value. Streptomycin and penicillin in combination are fully justified as prophylactic therapy in the handling of surgical patients for here, again, the peritoneum is very vulnerable and can be exposed during gastrointestinal surgery to contamination by both gram-negative and gram-positive organisms.

For the treatment of Streptococcus facealis infections, a combination of penicillin and streptomycin can be defended. The best chance to obtain a result with streptomycin is within three to seven days. Organisms develop resistance very rapidly, some within a matter of hours, so that the opportunity to use streptomycin constructively is short-lived. It is an open question whether administering penicillin in combination with streptomycin delays the emergence of resistance to streptomycin, but this is a possibility. In general, however, if no beneficial effect has been noted, it is purposeless to continue streptomycin for periods longer than 10 days in the treatment of acute infections. When treating subacute bacterial endocarditis, it is our practice to administer 2,000,000 units of penicillin per day, frequently in combination with 2 gm. per day of probenecid and during the second and fourth weeks of therapy, to administer 2 gm. of streptomycin intramuscularly each day.

At an investigational level, we are seeking to treat typhoid fever with high dosage penicillin and probenecid, for it has been shown that 25 units/ml of penicillin will kill the majority of strains of typhoid bacilli. The continuance of a search for a therapy of typhoid fever is justified since chloramphenicol has been shown to cause aplastic anemia. There is a significant relapse rate of typhoid fever after chloramphenicol therapy and it is ineffective in treating the carrier state of typhoid.

Our knowledge of useful combinations of chemotherapeutic agents is limited, and we have much to learn about the useful application of combined chemotherapy. The difficulty of the situation can be emphasized by recalling that earlier I mentioned that Dowling and his associates have shown an apparent antagonism between penicillin and aureomycin when used to treat pneumococcal meningitis. We have found

this same combination of agents to be beneficial in the treatment of a case of staphylococcal endocarditis. Our study of this particular case was detailed enough to show conclusively that neither aureomycin nor penicillin alone could accomplish the same favorable effect noted after the use of the combination of agents. Accordingly, I would like to repeat that the question of antagonism, synergy or addition of antibiotic effects, should be restricted to discussions that pertain to a particular infection.

Few physicians have laboratory facilities available that permit the assay of antibiotics in the bloodstream or even the performance of proper sensitivity tests. There is, however, a simple test that should be of great help and should be within the reach of almost everyone, providing the causative organism has been originally isolated. When antibiotic agents are administered to a patient, they are absorbed and distributed throughout the body by way of the bloodstream. Thus, at any particular moment the patient's plasma or serum contains some of the agent or agents that have been given by way of therapy. It is an extremely tedious and costly procedure to attempt to measure separately the antibiotics in the serum, but the "total" antibiotic effects can be measured. The plasma of the patient can be tested for its ability to inhibit a culture of the originally isolated organism, and it can be readily shown whether the concentrations of antibiotics in the patient's serum are adequate or inadequate to inhibit the organism. Following the usual rule of thumb, a concentration five times that required to inhibit the organism is desirable. The adequacy of therapy can be promptly measured by making serial dilutions of the patient's serum. Any laboratory capable of doing serological testing will be qualified to carry out this simple test, and the guidance that it gives the clinician is of tremendous help. It might be said also that this simple test permits some rough measurement of whether a single agent or a combination of agents is more beneficial. Should the drugs prove to be antagonistic, the plasma tested after administering a combination will be less effective than the plasma tested after giving one component of the combination.

In conclusion, then, of this discussion of combinations of chemotherapeutic agents, let it be said that additive and suggestively synergistic effects have been demonstrated. The evidence of antagonism at the clinical level is meager, but it should be anticipated in some instances. Our need for a more thorough knowledge of the purposeful combination of drugs is urgent and great.

The Administration of Chemotherapeutic Agents

HAVING discussed both the dosage schedules and the indications for using the chemotherapeutic agents, a word about the routes of administration is in order. In Table V the routes of administration that are regarded as the proper ones are indicated by a + sign, the ± signs indicate questionable routes of application, and the − sign indicates contraindication to that particular route of administration. There is an increasingly general feeling that sulfonamides, penicillin, streptomycin, aureomycin, terramycin, and chloramphenicol should not be used for topical application except in extraordinary situations. These agents are most valuable as systemic therapies, and if these systemic agents are used to treat some trifling infection, the patient may become sensitized and the benefits of subsequent use for the treatment of serious systemic infections may be lost forever. It behooves all of us to guard the medical futures of our patients carefully. Tyrothricin, bacitracin, polymyxin, and neomycin should be regarded as the agents of first choice for topical applications. Sensitization following the use of these drugs is uncommon, but even should a patient become sensitive to them, the loss will be small for they are seldom employed for systemic therapy. These agents constitute a broad attack against gram-negative and gram-positive organisms and, consequently, are well suited for the treatment of the mixed infections which are common on surfaces exposed to the air.

TABLE V.
ROUTES OF ADMINISTRATION

Drug	Topical	Oral	I.M.	I.V.	I.T.
Sulfonamides	±	+	−	+	−
Penicillin	±	+	+	+	± 10,000 U.
Streptomycin	±	+	+	±	± 50-100 MG.
Aureomycin	±	+	−	+	−
Terramycin	±	+	−	+	−
Chloramphenicol	±	+	±	+	Rare
Tyrothricin	+	−	−	−	−
Bacitracin	+	Rare	± 40-150,000 U.	±	Rare
Polymyxin	+	Rare	±	−	Rare
Neomycin	+	+	±	−	−
Erythromycin	?	+	+	?	?

± Special Cases, Not Generally Recommended.
? Uses Not Defined, New Drug.

The sulfonamides, aureomycin, terramycin, and chloramphenicol were introduced to clinical practice as oral medications and only more recently has penicillin received proper recognition as an orally effective agent. The dosage schedules of penicillin have been defined in units and there has been a general reluctance to define penicillin dosage in metric terms. With the increasing availability of penicillin it is quite probable that the step will be taken at some time in the near future and, when this is done, it will be obvious to all that in terms of grams, the orally effective dose of penicillin is considerably smaller than is the case for the broad spectrum antibiotics. A million units of penicillin is only 0.66 gm. and this amount of drug administered by mouth in divided doses is as effective for the handling of 80 to 90% of penicillin-sensitive infections as is 300,000 units of procaine penicillin intramuscularly. Streptomycin and neomycin are administered orally for their effects upon the gastrointestinal flora, but neither drug is absorbed in any significant quantity and hence the

effects of orally administered drug are limited to the gut.

Penicillin and streptomycin are commonly employed intramuscularly; chloramphenicol, bacitracin, polymyxin, and neomycin are only rarely administered parenterally.

The pro's and con's of intrathecal administration of antibiotics are much discussed. I am on the side that ranges itself against intrathecal administration. Making the decision in the case of meningitis is difficult, but even in the cases of purulent meningitis, intrathecal penicillin is unnecessary. Penicillin, in quantity, diffuses across the inflamed blood brain barrier, and it has been observed that within a half hour after the intravenous administration of 500,000 units of potassium penicillin or the intramuscular injection of 100,000 units or more of penicillin, demonstrable concentrations of penicillin can be found in the spinal fluid. Getting the antibiotic into the cerebrospinal fluid by diffusion seems preferable to intrathecal administration that entails certain real hazards. Death is reported as a result of administering 300,000 and 500,000 units of penicillin intrathecally. The administration of such large amounts of penicillin is obviously an error, but the likelihood of such errors occurring, always exists. We have seen convulsions result from as little as 50,000 units given intrathecally, and it should be recognized that the nervous system is hyperreactive when involved by an infection.

Of recent date, this thinking with regard to diffusion of parenterally administered antibiotic across the blood brain barrier is being extended to streptomycin, but many people have reservations when discussing tuberculous meningitis. The advocates of intrathecal streptomycin are many, but there is an increasing feeling that even in the treatment of tuberculous meningitis, intrathecal use of streptomycin is unnecessary. The group at Fitzsimons General Hospital, Denver, who have made outstanding contributions to the controlled studies of tuberculous patients, have found that in the presence of irritation of the meninges, streptomycin flows across the barrier in very significant quantities making intrathecal administration of streptomycin unnecessary. These observations have been confirmed at the Mayo Clinic. Streptomycin introduced intrathecally is not without danger and may contribute to the development of subarachnoid adhesions and even complete blocks to the circulation of cerebrospinal fluid.

Polymyxin is currently the most specific treatment for Ps. aeroginosa meningitis and represents, for the time being, an exception to the rule of not administering intrathecal antibiotics.

Some may have misgivings about these statements directed against the intrathecal administration of antibiotics, but attention is invited to a previous day in medicine when antipneumococcal serum was administered intrathecally. Any who administered serum in this manner will

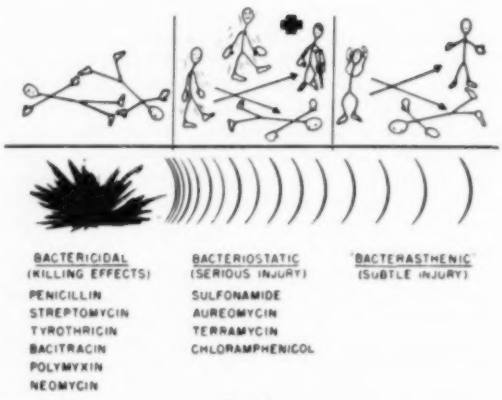

Fig. 4.

be reminded of the screams of torture of the patient and the lightning pains down the legs following such injections. At one time, intrathecal serum was regarded as good therapy, but with passage of time it has been shown that the therapy was not only lacking in effect, but was actually damaging. The same may very well prove to be the case in terms of our present use of antibiotics, and I look forward to that day when intrathecal administration of antibiotics will be sharply curtailed.

The "Atomic" Onslaught with Antibiotics

SOMETIMES one can make a point with a cartoon that he cannot make in any other way (Fig. 4). A successful antimicrobial attack upon a specific infection can be likened to the dropping of an atomic bomb upon a traget. Our ignorance as to the exact mechanism of action of the various antibiotic agents is profound, but in a general way we can say that some agents are bactericidal (killing) and others are bacteriostatic (inhibitory). The terms are relative, for any of these bacteriostatic agents in sufficiently high concentrations will kill; contrariwise, a bactericidal agent in less than maximally effective concentrations will be only bacteriostatic. In very low concentrations any of these agents exerts adverse metabolic effects upon bacteria and we have coined the term "bacterasthenic" for this type of action. If this adverse metabolic influence is sufficiently great and maintained over a sufficiently long period of time, the organisms eventually die or are overcome by the body's defense mechanisms (antibodies, leucocytes). If the organisms survive the deleterious effects and therapy is discontinued, the organisms may recover, fluorish and cause a relapse of the disease.

Interpreting the cartoon (Fig. 3), we might say that the objective of chemotherapy is to wipe out the invading hoard of bacteria as completely as possible, i.e., knock out 99% of the invaders at the first blow, if possible. There may be a few survivors, but if they are sorely wounded they will either succumb or fall victim to the body forces and thus the infection may actually

TABLE VI.
IF DRUG EFFECTIVE
CLINICAL RESPONSE WITHIN 72 HOURS OR LESS

Pneumonia	AM	Tularemia	AM
	TM	Scrub Typhus	SM
	CM	Murine Typhus	AM
	P		TM
Gonorrhoea	P	Rocky Mt.	
Plague	SM	Spotted Fever	CM
Typhoid Fever	CM	Q. Fever	AM
	P + Probenecid	Orinthosis	TM
Haverhill Fever	P		
Psittacosis	AM		
Brucellosis	TM		
	AM		
	CM		
Atypical	AM		
Pneumonia	TM		

AM—Aureomycin
TM—Terramycin
CM—Chloramphenicol
P—Penicillin
SM—Streptomycin

TABLE VII.
PNEUMONIA THERAPY

Specimens: Sputum, Blood Cultures 24-48 Hrs.	Laboratory Reports Anticipated 24-72 Hrs. Aureomycin Terramycin (Chloramphenicol)	Streptomycin
Penicillin		
Pneumococcal	+	
Streptococcal	+	
Staphylococcal (Some)	+	
	Influenzal	+
	Friedlander's (7)	+
	E. Coli	+
	Tularemia	+
	Q. Fever	
	Atypical Lymphopathia Venereum	
	Psittacosis	
		Tuberculosis
		Fungi
		Other Pulmonary Pathology

be treated successfully with a single dose of a chemotherapeutic agent. "Single-shot therapy" is seldom recommended or relied upon, but it is possible; gonorrhea is an example. We have actually treated bacterial lobar pneumonia with a single intramuscular injection of 300,000 units of procaine penicillin, and the majority of the patients so-treated went on to full recovery without additional treatment. From subsequent studies, we now know that patients receiving such therapy had less than 24 hours therapy in terms of having bactericidal concentrations of penicillin circulating in their blood. On the basis of this experience, which is similar to that of many other investigators, and knowing that penicillin has a profound killing effect upon many microorganisms, treatment for five to seven days is probably over-treatment in favor of the patient's interests, but we believe this "over-treatment" is proper. Academically speaking, however, it is possible to "atom bomb" an infection and knock it out with one blow.

Agents that inhibit growth and exert bacteriostatic effects rather than destructive ones, should be employed for a sufficiently long time to insure inability of organisms to recover and cause relapse. Treatment for five to seven days with aureomycin, terramycin, chloramphenicol, and sulfonamides is mandatory.

Effective Drug Therapy

ONE speaks about "effective" therapy, and it is being increasingly stated that if a particular treatment is not "effective" it should be discontinued and another substituted. In terms of specific therapy, a glance at Table VI will serve to define "effective" therapy. Despite the seriousness of some of the infections that are listed, a response in fever and a rapid rallying of the patient have been observed within 72, and more commonly 24 and 48 hours, after the beginning of treatment with the agents indicated. It should be obvious, therefore, that if the right antibiotic therapy has been chosen, the right dose selected and the drug administered by the proper route, the response should be dramatic within 72 hours. If no response is observed, it is "an engraved invitation" to reconsider the diagnosis of the agent that has been employed. Adherence to a given therapeutic program beyond the 72-hour limit without response is seldom justified.

It has been stated several times in this presentation that we do not always have the privilege of laboratory assistance in practicing medicine, and certain "rules of thumb" have been established. Let us assume that a patient has been diagnosed as having lobar pneumonia, and that he is at home, with the nearest laboratory some miles away. Therapy must be instituted without bacteriologic or roentgenographic confirmation of the diagnosis. In Table VII is presented a schema of the possible handling of such a case. The first choice of therapy is penicillin, the range of dose being between 300,000 and 1,000,000 units per day either orally or parenterally administered. This choice of penicillin is predicated upon its ease of administration, its low cost, its non-toxicity, and its effectiveness against the three commonest causes of bacterial pneumonia —pneumococci, streptococci, and staphylococci. Within 24 to 48 hours the patient will usually respond in dramatic fashion, but, if not, a change is in order. The selection of aureomycin, terramycin, or chloramphenicol is appropriate for not only are these agents effective against pneumococci, streptococci, and staphylococci, but in addition, exert effects against the other infective agents listed. Here again, if after an additional 48 hours the patient has not responded, the likelihood of tuberculosis on the basis of numerical incidence, is great. On the other hand, the patient may be suffering from an unresponsive virus disease. By this time, laboratory reports may be in hand to point the course of therapy definitively, but, if not, therapy with streptomycin is justified for not only does streptomycin exert antimicrobial effect upon the tubercle bacillus, but also upon the important pathogens—influenza bacilli, Friedlander's bacillus, E-coli and Past. tularensis. If, after a total of six or seven days under this attack, the patient still has not

TABLE VIII.
PROBLEM SITUATIONS
(INCOMPLETE LIST)

Brucellosis
Meningococcus Infections
H. Influenzae Infections
Strep. Faeculis Infections
Staph. Aureus Infections ("Penicillin Resistant")
P. Vulgaris
Ps. Aeruginosa
M. Tuberculosis
M. Leprae
Shigellosis
Salmonellosis
Typhoid Fever

responded, it is highly probable that he suffers from a disease other than a bacterial one, possibly one due to a virus, a fungus, carcinoma or pulmonary infarction. By following this schema of therapy, a certain amount of differential diagnosing has been done by the exploratory use of antibiotic agents. By these purposeful changes in the therapy being used, the likelihood of having permanent pulmonary damage by reason of unimpeded progression of an infection due to the Friedlander's bacillus or resistant staphylococci is minimized. Infections of this type resist the first attack with penicillin, and, if the ineffective treatment is continued, the disease has an opportunity to advance and produce irreparable structural damage. By following a course of therapy outlined, one will have a full awareness within a week of the seriousness of his problem, and the best interests of the patient will have been served.

Problems Remaining

THE impact of the antibiotics on mortality rates has been without parallel in man's history. The impact was immediate and the extent of the influence of these valuable agents was limited only by their availability. No statistical analyses were required to prove the effectiveness of penicillin and the other antibiotics. Despite these "miracle" drugs, we still have bacterial disease problems, to say nothing of the problems of virus diseases. As physicians, we are inclined to be a bit pessimistic and to focus attention upon shortcomings of our performances rather than to accent our accomplishments. In Table VIII are listed a few of the problems that still harass us. Certainly, some organisms are not subject to specific attack with any of the available agents, and some of our therapeutic failures are assignable to this cause. Other failures are due to "human error" in diagnosis and in application of the available agents. It has just been pointed out that delay in altering therapy or arriving at the correct diagnosis may result in extensive pulmonary damage by reason of an uncontrolled infection due to Friedlander's bacillus or a resistant staphylococcus. Any concession of time that we yield to an infection is recorded on the debit side of the therapeutic ledger, but in the case of some infections, even though our therapy is specific, the rapidity with which the pathology of the disease advances is such that the most rapidly delivered therapy is none too swift. An example of this type of disease is H. influenzae meningitis. We have excellent antimicrobial therapy for this disease, but despite the effectiveness of treatment the damage to the central nervous system is considerable and we are seeing an increasing number of children surviving who have suffered permanent brain damage. In conditions of this type, not only must the diagnosis be ar-

TABLE IX.
MARKSMANSHIP IN CHEMOTHERAPY

I. Definition of Target

Clinical Acumen

Judgment

Laboratory Assistance

Take Specimens Before Treatment—Sputum, Blood, Urine, etc.
Make a Smear and do a Gram—Stain.
Do Sensitivity Tests But Don't Accept Them Without Reservation.

Failure to do Everything Possible *at the Beginning* May Mean the Complete Loss of the Opportunity or the Loss to the Patient of Much Valuable Time.

II. Choice of Weapons

GUNS	ANTIBIOTICS
A. When Target is Defined.	
A Rifle is Better than a Shotgun	A 'Narrow' as Opposed to a 'Broad' Spectrum Drug is Preferred.
Shoot to Kill, Not Just to Maim.	A Bactericidal is Better than a Bacteriostatic Drug.
Choose a 'Dainty' Weapon if Mounting the Skin or Eating the Carcass Interests You.	Use a 'Topical' Rather than a 'Syatemic' Drug if a Choice is Possible.
Use Everything at Hand to Kill the Beast if no Single Lethal Weapon is Built for the Purpose.	Combinations are Fully Justified when there is no Specific Agent.
B. When the Target is "Not so Clear!" The Patient Must Still Be Treated, But—	
Don'ts	
Don't Shoot in the Air! Don't Enrage the Foe Without Advantage.	Don't use Streptomycin First.
Don't Rattle the Saber, the Microbes have no ears and They Know no fear.	Some Combinations of Drugs Offer Little or no Hope of Synergistic or even Additive Effects.
Don't Keep Shooting Just Because you have Ammunition.	If an Agent Fails to Give Evidence of Benefit in 72 hours, You Probably have the Wrong Gun.
Don't Forget that Man is not a Test-Tube!	The Circulation can be Sterilized Much More Readily than Bacteria in the Tissue can be eradicated.
Don't Shoot the By-Standers.	Just because Drugs go into Solution and through a Needle, don't use them Intravenously or Intraspinally without indication.
Do's	
Lay Down a Barrage Against all Comers.	Use a Single Broad Spectrum Agent.
	Use a Combination of Drugs so that Gram-Positive and Gram-Negative Organisms are Hit.
	Use Drugs Intravenously (to Tolerance) to Achieve Maximal Benefits and yet Avoid Physiological Disturbances.
	Use the Least Toxic Agent First.

rived at as rapidly as possible, but also the proper therapy chosen and that therapy delivered to the sites of infection as promptly as possible. This again invites the question as to the wisdom of intrathecal administration of antibiotics, and we are on the horns of the dilemma whether to treat the infection or further to irritate an irritated central nervous system. I still feel it is well *not* to invade the subarachnoid space.

The successful therapy of disease depends upon having effective agents and being able to make rapid and accurate diagnoses. The pathology of some diseases is such that prompt diagnosis and successful therapy are difficult, but we must strive contantly to improve our means of attacking those diseases. There is good reason to believe that in time we will succeed.

Summary

IN THE foregoing presentation, an effort has been made to survey the field of chemotherapy. The impossibility of surveying such a tremendous field of human knowledge is apparent to everyone, and the attempt that I have made to do so was undertaken only in the hope of defining some broad principles of chemotherapy that might be of service at the practicing level. Admitting the potential danger of making any generalizations, a sincere endeavor has been made to make statements that are applicable in the majority of situations without making the generalities so lacking in specificity that they are of no real help to the man who is dealing with a problem at the bedside or in his own community practice. It is with this in mind that the tables of dosage indications and routes of administration have been made as extensive as they have without any pretense of making them complete.

Some of the specific aims of chemotherapy and some of the broad principles that should be followed have been outlined in Table IX. If anything that has been set forth in this review is of practical assistance to a few who have heard or read this manuscript, the effort expended in its preparation will have been richly repaid.

(640 North Broad Street.)

The Goat on the Hill

IMPORTANT therapeutic and deodorant applications of chlorophyll derivatives have unfortunately become confused with reports of chlorophyll popcorn and chlorophyll diapers, with some pretty mediocre television humor, and with a rhythmic but inaccurate couplet about the goat. Take the question of why a goat reeks even though he stands on a hill eating his fill of chlorophyll. It is appalling how many scientifically qualified people have been victimized by that goat. The fact is that the goat's digestive system and the goat's odor are biologically unique and not to be compared with normal human digestive processes or odors. When a goat eats grass he is partaking of an oil-soluble chloroplast. He does not have the capacity to convert this to the type of chlorophyll derivatives which have been clinically proved to have the deodorizing property. Thus there is much rhyme, but no reason to the often repeated couplet about the goat and chlorophyll. The action of green grass has no more to do with the action of processed chlorophyll than the action of coal tar has to do with the well-known coal-tar derivative, aspirin. One would not expect coal miners to be free of headaches because they inhale coal dust. Nor should anyone who understands the subject expect a grass-eating goat to be free of odor. Equally disturbing are the ridiculous applications of chlorophyll which have no relationship to the clinical work that has been done. Some promotionally-minded manufacturers and advertisers put a little chlorophyll in a product and then invoke sound research on different products, different dosages, different applications. They may be successful in fooling the public for a while. But in the longer view, they are inviting public and professional disappointment with chlorophyll products, and, unfortunately, the harm done by the chlorophyll popcorn and the chlorophyll-impregnated baby pants hurts not only them, but sound products as well. This hampers the serious scientific work in the field. Those of us who have spent years of study on chlorophyll's legitimate use in medicine have a right to be upset when we see impossible values attributed to it. We are only on the threshold of a full understanding of the properties of chlorophyll and of the values it may hold when properly applied.

—DR. F. HOWARD WESTCOTT, at the American Pharmaceutical Manufacturers Association Meeting, New York, February 3, 1953.

The Treatment of Cancer with Radioisotopes

CLINICAL REPORTS

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RADIOACTIVE isotopes from nuclear piles constitute one of the most promising attacks on cancer since the discovery of radium half a century ago. Within the last four years more than a score of clinical reports have been published on the anticancer action of As^{76}, Au^{198}, Co^{60}, I^{131}, P^{32}, Na^{24}, and Sr^{89}. While some cancer specialists regard radioisotopes merely as a palliative treatment for advanced cases of various neoplastic diseases, others are pioneering in new methods of administration for deep-seated human cancer.

Radioarsenic. As^{76} is reported to be as effective as nitrogen mustard, P^{32}, urethane or x-rays in the treatment of tumors of the hematopoietic tissues. Block and associates[1] drew this conclusion from their administration of this isotope intravenously in 24 patients with Hodgkin's disease and leukemia.

Radiogold. Three clinical investigations have recently been released on the anticancer action of radiogold. Hahn and Carothers[9] found that direct infiltration into lymphosarcomas of patients brought about regression of the tumors. Kent and Moses[13] injected the isotope into the pleural space and reported a check in the formation of pleural fluid in carcinomatosis of the pleura. Clarke and LeRoy[2] used radiogold injections *vs* a palliative in many forms of advanced cancer.

Radiocobalt. Three clinical reports were published in 1951 on the use of Co^{60}. Morton, et al[16] employed needles of the isotope inserted through a leucite template, in the irradiation of the uterine cervix. They noted regression of tumors in nine patients. James and co-workers, in two papers[10,11], used nylon tubes for implanting Co^{60} in the treatment of non-resectable head and neck cancers.

Radioiodine. An impressive number of clinical studies have been released currently on evaluating the use of I^{131} in thyroid cancer. Dobyns and Maloof[6] summarized their findings on 119 cases of carcinoma of the thyroid treated with radioiodine and thiouracil. Rall and associates[18] also reported the same combination helpful in thyroid carcinoma. Trunnell, et al[22] sought to evaluate their experience with the isotope in metastic thyroid cancer. Seidlin[21] in 1949 submitted a six-year progress report with I^{131} therapy of metastases from carcinoma of the thyroid. The same year[20] this investigator reported successful treatment of six patients with thyroid carcinoma.

Crile[3] treated a patient with divided doses of radioiodine for papillary carcinoma of the thyroid. Frantz and associates,[7] and Kaae and Petersen[12] have evaluated their clinical experiences with I^{131} given orally to patients with thyroid cancer. Rawson, et al[19] studied the limitations in the treatment of thyroid cancer with radioiodine. Kent and Moses[13] found that I^{131}, like Au^{198}, was effective in the palliative management of carcinomatosis of the pleura.

Radiophosphorus. Radiophosphorus has been used extensively in the treatment of leukemia. Friedell and Storaasli[8] prolonged the lives of patients suffering with myloid leukemia by intraperitoneal injections of P^{32}. Diamond and coworkers[4,5] administered the isotope orally to patients with myeloid and lymphatic leukemia with good results. Lawrence and associates[14] administered P^{32} orally and intravenously to 100 patients with chronic lymphatic leukemia. A year later this investigator and Wasserman[15] used intravenous injections on 24 patients with multiple myeloma. Osgood[17] reported 32 of 58 patients with lymphocytic and granulocytic leukemia were helped with P^{32} therapy.

Radiosodium. Wallace, et al[23] secured regressions of carcinoma of the bladder by intracavitary irradiation with solutions of Na^{24}.

Radiostrontium. Lawrence and Wasserman[15] have reported that Sr^{89}, like P^{32}, produced some improvement in patients with multiple myeloma when given intravenously.

[NOTE: The author is indebted to Dr. E. Emmet Reid, Professor Emeritus, Johns Hopkins University for his interest in this research. The original literature has been made available through the cooperation of the Army Medical Library and Mr. R. C. Tucker, of the Furman University Library.]

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Instrumentation in Industrial Hygiene

THE SCHOOL of Public Health and the Institute of Industrial Health, University of Michigan, have now well under way elaborate plans for an In-Service Training Course during the week of February 15, 1954, at Ann Arbor, on "Instrumentation in Industrial Hygiene," with a Symposium and Clinic, and an extensive exhibit of the scientific instruments used in all phases of industrial hygiene. These plans have been evolved to fill a growing need. The number of instruments used in sampling, measuring and evaluating environmental exposures has increased rapidly during the last few years, and with the increase in number, there has been a corresponding refinement in complexity and specificity of application. No one place exists where information on all of these instruments can be obtained—not even a catalogue; and such information as is available is often more adapted to sales than to science. The School and the Institute at Ann Arbor intend to bring them all together, at one time and place, for the purpose of their scientific study and demonstration. The Symposium and Clinic will be directed to the specific uses of all of the techniques and means of instrumentation, the scientific principles on which they are based, and their applicability to the specific situations for which they are designed. The exhibits will be entirely free from any sales or commercial significance. Underlying the whole project is the desire of the School and the Institute to offer the latest and best scientific answers to the needs of workers in the fields of industrial hygiene as these needs are identified by the workers themselves.

Keeping Rheumatic Patients Employable

From the Conference on Rheumatic Disorders in Industry
Anthony J. Lanza, M.D., Chairman

The Incidence of the Rheumatic Diseases in Industry

JOSEPH J. BUNIM, M.D., Chief, Arthritis and Rheumatism Branch
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WE HAVE long been aware that adequate data on the incidence or prevalence of arthritis in this country are not available. Repeatedly we have been quoting the figures from the 1938 national survey. However valuable that survey was, its nature and method were not such as to yield data as precise and objective as we need for a basis of planning.

At present two attempts are being made to ascertain more dependable and more exact data. One is a survey of a community which is being planned in Pittsburgh by a group headed by Dr. Sidney Cobb and associates. The other is a different type of survey. Instead of examining a community, an industry is being surveyed, and this is the one I shall report on now. It deals with the survey being conducted at Consolidated Edison.

There are advantages and disadvantages to both types of surveys from a biometric and statistical point of view, but I believe that these two types will complement each other since we will get a different type of information from each.

Before we started this survey, we wrote to six large industrial concerns in New York, Pittsburgh, and Detroit asking for information as to the incidence of rheumatic diseases in their respective employment situations. These companies varied in size from 5,000 employees to 500,000. We found, much to our disappointment, that we were unable to utilize the information or the records from five of these six. The reasons are important, and interesting.

For medical department records correctly to reflect the prevalence or incidence of any or all diseases among the employees, the following conditions must prevail: (1) Patients must be required to report their illness when returning from sick absence. (2) They must be examined by company physicians. (3) Records must be kept completely with emphasis on a complete description of the objective physical findings (which in our survey we are finding to be even more important than the laboratory data). (4) A diagnostic file must be kept. (5) Standard nomenclature must be used (in rheumatic diseases, the nomenclature of the American Rheumatism Association). Only under these circumstances can an industrial concern gain an insight into its medical problems and be in a position to base its medical program upon valid data. Of the companies we approached only the Consolidated Edison Company had records which more or less fulfilled these requirements.

Just a few words about the background of the employees of the Consolidated Edison Company as of the end of 1950. There were 26,197 employees. Ninety percent were males, and 10% were females. The average age of the males was 43 years, and of the females, 39 years. About one-third of the males and about one-fifth of the females working for Consolidated Edison are over 50 years of age. The average stay of the employee at Consolidated Edison is 17 years. One-fourth have been employed for 25 successive years or longer, so this is an unusually stable population. This is one of the advantages of analyzing an industry in contrast to a community.

As to the type of employment, we have only enough time to be general: 70% of the employees do physical labor, and 30% are doing clerical work. The men working at the Consolidated Edison Company must retire at age 65; women at age 60.

When an employee is sick for longer than two working days, it is compulsory that he report to the Medical Department and be examined by a

TABLE I.
RECLASSIFICATION OF RANDOM SAMPLE OF 500 AMONG 1551 CASES DESIGNATED AS ARTHRITIC DISEASE

Diagnosis	Cases No.	Cases %
Degenerative joint disease (symptomatic)	74 [a]	14.8
Undiagnosed joint disease	28	5.6
Bursitis	26	5.2
Gout	21	4.2
Rheumatoid arthritis	15 [b]	3.0
S-I* or L-S**, etc., strain	15	3.0
Rheumatic polyarthritis	6	1.2
Ruptured I-V disc	5	1.0
Myositis	3	0.6
Arthralgia	2	0.4
Scalenus anticus syndrome	1	0.2
Luetic osteitis	1	0.2
Neuritis	1	0.2
No arthritic or rheumatic disease	26	5.2
No diagnosis possible	276	55.2
Total	500	100.0

(a) 3 cases—secondary to trauma
(b) 2 cases—Marie Strumpell syondylitis.
* S-I: Sacro-iliac. **L-S: Lumbosacral.

The papers here presented comprise the subject matter of the Conference on "The Rheumatic Disorders in Industry: Techniques for Keeping Patients Employable," which was held under the sponsorship of the New York Chapter of the Arthritis and Rheumatism Foundation at the New York Academy of Medicine Building, February 4-5, 1953.

company physician. This, to us, was the most important requirement, making it possible for us to determine the prevalence of arthritis in this industry.

In the five-year period from 1947 to 1951 inclusive, 1551 employees were absent from work because they were incapacitated by some type of rheumatic disease. Thus far in our survey we have reviewed 500 of these records (Table I). In about one-half of the records the laboratory data and the histories and physical findings were so completely and carefully recorded that we could independently arrive at a specific diagnosis.

Among those records where it was not possible to arrive at a specific diagnosis, the essential item most frequently lacking was an objective description of the joints—as to whether they were swollen, red, tender, warm, and whether deformity was present.

Based upon the 198 records permitting accurate diagnosis, we found the approximate *relative* prevalence of rheumatic diseases to be:

RELATIVE PREVALENCE

	Per cent
Degenerative joint disease	37
Bursitis	13
Gout	11
Rheumatoid arthritis	8
Other rheumatic disorders	31

Also of interest is the fact that in this company employing approximately 25,000 persons, about 4,200 work days have been lost per year because of rheumatic diseases. Assuming that this employee group is representative of employees throughout the country, we can estimate that in the United States, with 62 million gainfully employed, the average work days lost would approximate 10,500,000 per year.

[NOTE: The foregoing article is a preliminary report on a study being done in collaboration with DR. ROBERT BROWN and MISS CLAIRE LINGG. This work is supported by a grant from the New York Chapter of the Arthritis and Rheumatism Foundation.]

Compensation Aspects of the Rheumatic Diseases

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New York State Workmen's Compensation Board

THE findings as to the relationship between any accident or disease and resulting disability are always based upon medical testimony, and that medical testimony, both pro and con, is carefully evaluated by the referee, the Workmen's Compensation Board or the courts, none of whom is a physician, to determine where the weight of probability falls. I have taken the classification of diseases of joints and related structures as adopted by the American Rheumatism Association and, in the short time at my disposal, will make brief and general statements regarding the compensation aspects of these various conditions.

Rheumatoid Arthritis

I DO NOT recall any cases in which an accident or occupational condition has been claimed as being the sole cause of this disease. The literature does raise the question of exposure to climatic conditions as a direct etiological agent. However, as causing exacerbation of symptoms, it has been successfully claimed that accidents and exposure may increase and prolong existing disability. This is particularly true of direct trauma to the peripheral joints but also is found in cases of back strain due to lifting or twisting as well as direct trauma. Also trauma to one joint may initiate acute symptoms in that joint, which may then spread to other joints which were not subjected to any trauma. These cases are extremely difficult to evaluate and require medical testimony and opinion as to causal relationship.

Osteoarthritis

DEGENERATIVE joint disease (osteoarthritis or hypertrophic arthritis) is in general not compensable except when the employee has been working under conditions that involve repeated minor trauma to the affected joints.

On the other hand direct trauma, especially when consisting of a fracture involving a joint, may occasionally cause a severe and extensive arthritis which in some cases progresses to complete destruction of the joint. This is almost always considered compensable.

Low Back Pain

THE most common problem and certainly the most difficult is the compensability of low back strain. The only objective signs may be limitation of motion and muscle spasm. Yet a patient may claim to be incapacitated because of pain arising out of lifting or pulling while on the job. A reasonable time relationship must be established between the injury and the onset of symptoms. Under these circumstances a patient is frequently awarded a compensation claim.

Fibrositis

THE principal example of fibrositis seen in compensation cases is Dupuytren's contractures. Many competent physicians claim that trauma plays no part in either the onset or aggravation of this condition. However, there are other equally qualified physicians who believe that trauma does aggravate the disability which occurs, and causal relationship is allowed in a great many claims of this nature. Until more proof can be found as to the exact etiology of this disease, and as long as differences of opinion continue to exist, these claims will doubtless be upheld.

Gouty Arthritis

ARTHRITIS due to gout is a condition considered to arise from a metabolic defect and hence is not ordinarily regarded a compensable disease. There is little doubt however that an exacerbation may be precipitated by trauma. Under these conditions, it is possible to consider the acute episode as compensable.

Infectious Arthritis

ARTHRITIS due to specific infections, especially tuberculosis and syphilis, is generally conceded to appear quite frequently in those joints which have been subjected to trauma. A proper time interval between the accident and the onset of symptoms must, of course, exist for the finding of causal relationship.

Hydroarthritis

HYDROARTHRITIS is frequently claimed to be due to trauma, either direct or indirect, and is seldom questioned. Recurrences of the condition, without additional trauma, at a later date may cause controversy as to its relationship.

Serum Sickness and Drug Intoxication

UNDER the miscellaneous diseases, drug intoxication where the drug was given for some compensable condition is certainly compensable. Serum sickness is in the same category.

THIS general presentation is intended to point out that most conditions falling in the general category of rheumatic diseases are frequently claimed to be due to compensatory accidents or diseases. Each condition must be decided purely on its own merits and on the weight of medical evidence. A particular condition must arise out of and during the course of employment before compensation can be claimed.

The Role of Physical Rehabilitation in Keeping the Patient with Rheumatoid Arthritis Employable

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New York University College of Medicine

WITH the advances of the past four years in the treatment of the rheumatic diseases there has been a great upsurge of hope among chronic rheumatoid arthritic patients. Those struggling to maintain their jobs have turned to the new drugs for relief to assist them in maintaining their economic independence; those chronically disabled have been stimulated to seek new help which might restore them to self-sufficiency. Both the maintenance of such a patient in his job and the restoration of a disabled arthritic patient to independent status can constitute major problems. On the other hand, too frequently a negative attitude towards the potential of the rheumatoid patient blocks productivity which is well within reason and feasibility. We have endeavored, therefore, to demonstrate that a large share of rheumatoid patients, if properly managed, can either remain on jobs or be returned to jobs, the latter often after years of unemployment imposed upon them by the negative attitude of personnel offices.

In the over-all evaluation of the patient with rheumatoid arthritis, many facets of the patient must be known before an adequate and reliable total objective can be established (Fig. 1). It is not enough to have a proper diagnosis and an evaluation of the medical status of the patient. It is imperative that the latter be established, since there are more than 100 different types of rheumatic diseases for which treatments vary considerably. It is of interest in this regard that more than 10% of patients referred to our clinic in the past two years as having rheumatoid arthritis of a disabling degree have actually been afflicted with other disorders and have not had rheumatoid arthritis. In addition, however, to the medical status of the patient, it is important to know the patient's functional status and his socio-economic status. Limitations of ranges of motion in joints, specific muscle weaknesses, and his functional proficiency in activities necessary to self-sufficient living (activities of daily living) must be specifically tested. Finally, a full picture of his psychological, social, economic and vocational assets must be added before the full picture of the patient's rehabilitation potential may be formulated. The extent of the assets in all of these spheres in summary determines the feasible goal for the particular patient. Conversely, the deficits modify the approaches to treatment and the management of the individual. The problem may be a simple one of proper job placement or it may be a knotty one of a severely disabled patient needing hospitalization and intensive full-day treatment with physical therapy, occupational therapy, remedial exercise, functional training, psychologic and psychiatric assistance, vocational guidance, and job retraining. In all instances, however, the desired objective is the return of the patient to his maximum physical, social, and economic status within the limitations of his disability but at the hilt of his capabilities.

REHABILITATION EVALUATION		
Medical History		
Physical Examination		Diagnosis & Physical
Laboratory Examinations	=	Prognosis plus
Specialist Consultations		
Muscle Test		
Joint Range of Motion		Functional Capacity
Activities of Daily Living	=	& Potential plus
Speech and Hearing Evaluation		
Psychological Testing		
Social Survey	=	Economic Potential
Vocational Testing		
	=	Rehabilitation Potential

Fig. 1.
The patient must be totally evaluated if an accurate rehabilitation potential is to be established for him.

IN OUR experience with patients having rheumatoid arthritis, certain major factors have crystallized which we feel to be most paramount in the prognosing and establishing of goals for the individual patient.

Fig. 2.
The destructive changes and lipping seen here are changes secondary to the rheumatoid process and mechanically limit the extent of rehabilitation for the patient.

1. Joint Tolerance

IT MUST be remembered that the rheumatoid disease process includes, in addition to the synovitis, a chrondritis, an osteitis, and a sterile osteomyelitis of the joint which predispose the joint to destructive as well as obliterative changes. Excessive physical activity imposed on such joints may result in increased wearing with the development of secondary hypertrophic changes (Fig. 2). The problem under such circumstances then presents itself as a two-fold one of inflammation and of mechanical impairment.

Physical activities for a patient must be maintained within the tolerance of his joints. This is important from the standpoint of the patient's comfort as well as for the prevention of further hypertrophic wearing which would culminate in greater reduction of activity tolerance and of functional capacity.

In rehabilitation of patients with severe arthritic involvement of weight-bearing joints, full extension of the joint must be the initial goal. Flexed knees are a short cut to a wheel chair, for weight-bearing on a flexed joint imposes work in a mechanically bad position. The resultant shearing effect imposes more rapid wearing, increased pain and muscle spasm, with the cycle eventuating in further flexion deformity of the joint and ultimate demobilization of the patient in a wheel chair. Similarly, weight-bearing on joints inadequately supported by weak muscles results in pain due to the trauma of joint instability and culminates in a cycle such as the above; muscles, therefore, should be restored to maximum strength before weight-bearing is permitted.

The rehabilitation problem with upper extremities is different from that with the lower. The latter are primarily work joints for weight-bearing and ambulation, while the upper extremities are primarily utilitarian and dependent more upon dexterity for function. Considerably broader goals, therefore, may be set for mechanically damaged arms and hands than for similarly involved knees and hips.

Careful evaluation of the status of a patient's joints and a thorough knowledge of the physical demands of a particular job are important to the sensible placement of a patient in a job. Just as the poliomyelitis worker who has residual leg weakness must be placed in a non-ambulatory work situation, so must the arthritic who has mainly lower extremity involvement. Similarly the arthritic with hand involvement can function well in gross hand work, whereas his joints might not tolerate fine tedious finger work which imposed considerably more fatigue. With such consideration and cooperation between the medical and personnel sections, arthritics can be job-placed so that they may competitively function on a par with any of their fellow workers.

2. Control of the Rheumatoid Process

WITH patients in whom there persists some activity of the underlying rheumatoid arthritis process, attention must be directed towards maintaining the disease under control. Generally this may be accomplished without sacrificing the patient's job. Moreover, every effort should be directed towards this latter to avoid subjecting the patient to the psychologic and emotional trauma inherent in economic dependence which, in itself, may viciously aggravate the arthritic process. Adequate rest during hours away from work and the regular use of a good home program of physical therapy are basic treatment precepts and should be instituted. In addition to these, drugs may be necessary. The most important drug for rheumatoid arthritis still is sodium salicylate and its compounds. Other preparations, however, may be necessary, such as gold salts or phenylbutazone. It should be pointed out here that despite the general impression, the prognosis for rheumatoid arthritis is considerably more favorable than is generally appreciated. A certain percentage of patients, near 25%, recover completely from their disease on simple, sensible measures of management, and an even larger percentage become arrested or smoulder without rendering the patient incapacitated.

In that residual group of cases, less than 25%, in which the disease process is a persistent and deforming one, it is necessary to resort to Cortisone for control. With this additional therapeutic aid many patients of this most severe group may be continued satisfactorily on jobs. It is assumed that with Cortisone it will be possible to transform an active progressive disease process into a static one. In a small group of patients—1% to 3%—there will be refractoriness to the hormone. Furthermore, undesired hyperadrenal effects from the Cortisone at times will necessitate discontinuance of the drug administration. Fortunately, however, if the daily maintenance dose of Cortisone is kept below 75 mg. per day the incidence of undesired effects is only 21% and most of these are of minor magnitude not requiring discontinuance of therapy; conversely, if the maintenance dose is kept above 75 mg. per day, the incidence of undesired effects triples, and is 63%.

In regulating Cortisone maintenance dosage it is important to differentiate the pain incidence to the inflammatory rheumatoid process from that consequent to the use of mechanically bad joints. It should not be expected that the latter will be relieved by Cortisone, and one should not be misled into hyperadrenal effects by increasing drug dosage to control these hypertrophic symptoms.

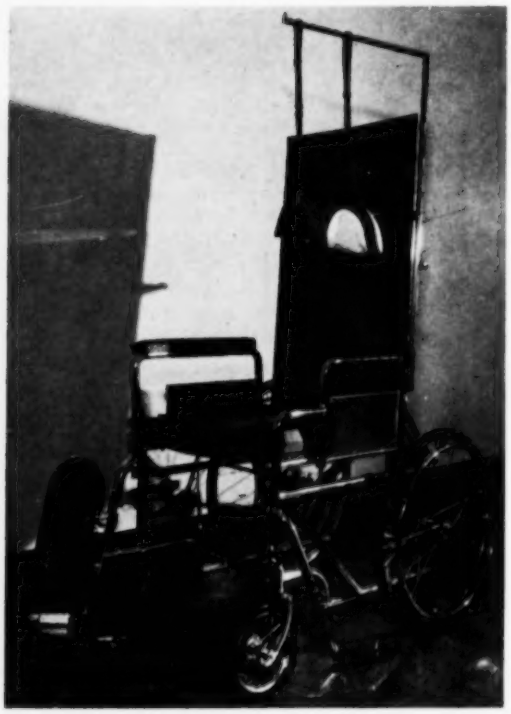

Fig. 3.
This demonstration wheelchair incorporates more than 20 different variations available for prescription as the needs of the patient require.

3. Psychologic Tolerance of the Patient

OF CONSIDERABLE importance in modifying the success or failure of a rehabilitation goal is the psychologic complexity of the patient. The chronically disabled rheumatoid arthritic patient over periods of years may progressively relinquish his self-sufficiency and become reduced more and more to dependency upon others. The resulting problem psychologically is like no other in rehabilitation. To halt abruptly the progress of a hopeless disease with Cortisone and suddenly about-face the patient's perspective is as difficult to effect as would have been a rapid acceptance of dependence initially.

It is an easy task to establish goals for a patient that are compatible with his physical and intellectual capacities, but it is considerably more tenuous to set goals acceptable to him psychologically, and to know that they are within the scope of his motivation. To obviate these limitations every effort should be exerted to give the patient a thorough understanding of arthritis as a disease, of treatment limitations, of reasonable goals, and to instill in him the insight to appreciate that what is to be accomplished will be done only by hard work on his part. In this way false hopes for cure or for reversal of damage which has accrued can from the onset be dispelled and objectives mutually appreciated.

4. The Use of Special Devices

INGENUITY in devising special gadgets and apparatus as individually needed is in many instances the key to broadening the rehabilitation scope for a patient. It should be stressed, however, that special devices or mechanical appliances are never used unless they are essential to proficiency in deficient areas. Braces and crutches must be individually prescribed. The latter especially require careful selection, depending upon the extent and degree of joint involvement and the resultant mechanical restrictions to which the crutch must be adapted.

For patients requiring wheel chairs, the chair must be individually prescribed. There are more

Fig. 4.
There are many toilet sitting modifications for the arthritic. This particular model is cheap, easily transportable, and will provide additional height up to six inches.

Fig. 5.
This patient with rheumatoid spondylitis and with ankylosis of the left hip required a special chair on casters in which he could sit comfortably and carry on with his job.

than 20 different variations for wheel chairs, and the proper prescription of these variants makes for the chair most adaptable to the particular disability of the patient (Fig. 3). Chairs similarly constitute a special problem. Usually seats higher than 20 inches and ideally 24 inches in height are necessary. Meeting this latter need alone often is the small difference between continued employability and unemployability of a patient. Toilet seats present a similar obstacle, and we have devised a special removable seat which is readily transportable but which provides the additional seat height needed by the patient (Fig. 4).

In cases of rheumatoid spondylitis with hip and knee as well as back involvement wherein sitting at a 90° angle is impossible, we have molded plastic seats to conform to buttock contours and to prevent sliding (Fig. 5). These have been useful not only in wheel chairs but also on high stands to provide sitting surfaces from which to work.

A multitude of other simple and more familiar devices are extensively used where necessary to provide self-sufficiency in self-care activities: zippered shoes, elastic shoe laces, long-handled combs, long-handled eating devices, dressing sticks.

5. The Importance of Functional Training

WHILE muscle power and joint ranges of motion are basic keystones, the real objective for the rheumatoid patient is proficiency in the performance of activities which are necessary to self-sufficient living. The former are worthless without attainment of the latter and should be pursued only towards accomplishment of the latter. Furthermore, muscle tests and joint measurements not infrequently are totally misleading indices of the potential of a patient for functional training. Functional proficiency *per se*, therefore, is primarily stressed, and we are repeatedly amazed at the degree of self-sufficiency which patients accomplish through tedious practice despite even severe organic limitations. This capacity to learn skills even in the face of marked crippling should not be surprising when it is remembered that as a machine the human body is less than 25% efficient, and that the consequent potential for improving this efficiency is therefore great.

Summary

1. THE prognosis for rheumatoid arthritis is more favorable than sometimes implied. Sensible medical management and careful job placement can maintain most such patients in productive employment.

2. Through the use of Cortisone and other drugs together with intensive rehabilitation procedures, many "hopeless cripples" can be rendered self-sufficient to return to jobs to compete on an equal basis with fellow workers.

3. Frequently the difference between employability and unemployability is a small variation which could readily be resolved with awareness and understanding of the problem together with a modicum of ingenuity.

Vocational Rehabilitation

HENRY VISCARDI, JR., Executive Director
Just One Break, Inc.

THERE is no question that many patients with arthritis—even those with severe residual handicaps—who are not employed could be employed. In the organization with which I am connected, Just One Break, Inc., we have had enough experience with these patients to know something about their potentials and also the difficulties in placing them and other handicapped people. To illustrate how patients with severe handicaps from arthritis can be satisfactorily employed, I have asked three of them to come here, and a little later we will discuss the way their employment problems have been solved.

First let us consider the community's stake in the problem. Those of us who work are supporting an ever increasing segment of the population who do not work either because they are too young, too old, too sick or because they are in some way disabled. Chronic illness, such as arthritis, accounts for one-half to three-quarters of a billion man-days per year lost from productivity and for public expenditures of $1.5 billion for medical and hospital benefits and $1.5 billion for cash benefits. These sums, plus the amounts of money being paid out in the form of compensation for industrial accidents and diseases, are so astronomical that the figures have lost their meaning for us.

One way this burden of dependency can be materially reduced is by rehabilitating and employing, instead of paying relief costs for, the many chronically ill and disabled people who although handicapped could work if (1) they were medically rehabilitated, and (2) the problem of their employment were intelligently handled.

During the past 10 years medicine has given effective attention to the integration of specialties to achieve medical rehabilitation of the patient to the point of employability. The internist, the orthopedic surgeon, the physical therapist or whatever combination of skilled medical personnel is required can be enlisted to prepare a patient with arthritis or another disability to lead a useful life within the limits of his disability. If his handicap is such that he cannot resume the kind of job he had before, there are vocational counsellors to help him choose and prepare for a different means of livelihood. But, unless he can achieve independence through a job, he has not gained much and the community has not gained at all.

It is at this point of employment that commerce and industry must accept more responsibility than they have in the past. They must do so in their own self-interest and not because of any altruistic reasons. Handicapped people make good employees. They do not float from job to job; their attendance records are superior to those of the non-handicapped. Industry needs stable, skilled people, and many handicapped can fill these specifications if the

Fig. 1.

Fig. 2.

problems of their employment are faced and solved. Often these special problems are comparatively simple and involve only an adaptation of a chair, a gadget, or a rearrangement of working space. Such problems can be solved by the integrated efforts of the industrial physician, the employment manager, the safety engineer, and the foreman.

There is another factor involved in placing the handicapped person in a job which is somewhat harder to deal with but one which it is better to face than try to ignore. The average business man in small or large enterprise, like most people, has an aversion to disfigurement and prefers the non-handicapped to the handicapped individual irrespective of relative competence.

Perhaps the possibilities and the difficulties involved in employing patients handicapped by arthritis are more readily visualized by reviewing the experience of Miss T., who has offered to contribute to our understanding of this problem by coming here. Miss T. developed rheumatoid arthritis in 1944 when she was 20 years old. She spent the next six years in hospitals or as a complete shut-in at home. Her knees, hips and elbows have been involved, and there is residual damage to these joints. For the past two and a half years, the combination of ACTH, which she administers herself, and a real will to work, have made it possible for her to hold a full-time job as my secretary. She operates a switchboard, runs a dictaphone, does some bookkeeping, and performs these duties competently. Aside from the time she has taken off to attend clinic for periodic check-ups, she has lost only two days from work during the entire two and a half years she has been with us. Yet I am sure that the average industry in this, or any other, community would refuse, except under certain influences, to offer employment to this young woman.

I should like to tell you of another of the more than 2000 people who have been placed through J.O.B., Inc., Mr. P. This man has had an even longer history of rheumatoid arthritis. He also spent years in hospitals during which time both of his hands developed severe and permanent contractures (Fig. 1) and, as a result of infected foot cut, underwent amputation of his left leg below the knee. From 1945 until 1949 he was seldom out of bed or wheelchair. The rest of the story is different. In 1949 he was admitted to the rehabilitation ward at Goldwater Memorial Hospital where he was fitted with a prosthesis for his amputated leg and taught to ambulate with the aid of a cane and to make maximal use of his hands. In 1951 he was discharged from the hospital.

In spite of his badly deformed hands we placed him as a proofreader for a typographical company. He proofreads type which is set up primarily for advertising copy and usually in foreign languages. He is, as he always was, a gifted person. When I met him on the ward at Goldwater Memorial Hospital he was writing a script for a program over the PA system for the patients and editing the hospital newspaper. However, in spite of his talent and the fact that his hands do not limit his use of these talents, the reaction to his deformity of most people in commerce and industry would preclude him from consideration for a job. In fact, the sight of his hands would, in most concerns, prevent his getting past the receptionist, if he had succeeded in getting past the elevator operator.

It is interesting that when we first went to the personnel manager of this typographical company and described our candidate's deformity, he admitted that it was probably more than he could endure but said he was willing to try. After a trial period of four months during which Mr. P. had definitely proved that he could do the work, the personnel manager came down to our office at Bellevue Hospital and said, "I am so well pleased with P. that I would like to get somebody else just like him." Knowing the nature of his business because we had carefully surveyed it, I suggested a polio paraplegic in a wheel chair who was well qualified for the work. He replied, "None of those seriously disabled people; none of those wheel chair cases! Give me another man like P."

Let me present just one more individual, Mr. F. He is 49 years old and has had rheumatoid spondylitis since 1936. The disease has severely bent his spine and neck (Fig. 2). He is now an employee of ours in a company operating in West Hempstead, Long Island. It is a subsidiary of J.O.B., Inc., and its personnel is made up entirely of the most severely disabled people we can find. Today our plant employs 46 disabled people.

We chartered this corporation on July 7, 1952, and went into production in September. This corporation was set up on borrowed capital. It pays prevailing wages, and it bids competitively with other industries in the area for all of its work. In the next 90 days it will expand, and will employ approximately 60 people. While Mr. F. is an arthritic, our people represent the range of every known disability including the totally blind. Our plant is

the dramatic laboratory where we do research and studies to impress and influence commerce and industry to keep pace with what has been done in the medical aspects of rehabilitation.

We have brought along the harness wiring assembly which Mr. F. operates. It is an electronic component of the automatic flight control mechanism on military transport, heavy bomber, and commercial transport planes. This is a 40 or 50 wire unit. In our plant this is engineered from the blueprint up to the final lacing and Mr. F. is one of the electronic team that laces the harness wiring assembly on this board.

We have realized that, because of his curved spine, Mr. F.'s range of vision is extremely limited when he sits, and obviously he cannot work from a standing position. So instead of using the standard-height work bench of 30 inches we have built a special sliding panel where he works that lowers the work bench height to about 26 inches. We have discovered that, if we give him the type chair where he can brace his elbows as he works, with these tremendous wonderful hands he can lace cables as rapidly as any one in our plant and more rapidly by four times than the average person in the plant from which we subcontract this work. The average production time on this cable assembly in the plant from which we subcontract the job exceeds two hours. Our approximate time is now below one hour for the same unit.

Mr. F. is now completely self-supporting. But I do not think he will mind if I tell you that for 10 years he went around New York with his banjo playing for nickels. And yet it is evident to me that when we sorely needed him during those critical days of World War II this man should have known and could have known the sweet dignity of a productive life.

These three people are good employees. So far as their capacities to do their jobs are concerned, they are not handicapped. Successful placements such as these come about from careful selection of (1) the person who really wants to work, and (2) a job that he can do. The first requires insight and the second requires considerable experience with industrial methods and a careful survey of the particular job. Sending one of these people out for a job which he could not do as well as a non-handicapped person would only serve to chalk up a failure for the individual and build up resistance to the idea of employing other handicapped in the concern which employed him.

LET ME draw this to a conclusion. The employment of our handicapped is as highly desirable from the community's point of view as from the individual's. Business and industry have been reluctant to hire the handicapped because of traditional attitudes of aversion, the special problems involved, and the emotional basis on which the problems are usually presented. Our handicapped people will be led to the dignity of a useful life, the community's burden of dependency will be lessened, and commerce and industry will be well served if the employment of the handicapped is put into the hands of those who fully appreciate the industrial problems involved and have the special skill and experience to solve them.

Keeping the Patient with Rheumatoid Arthritis Employable

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APART from strictly humanitarian principles, which include relief of pain and suffering, a major consideration in the treatment of a patient with rheumatoid arthritis must be the maintenance of his economic responsibility. The topic, therefore, is of some importance, not only to physicians concerned with industrial medicine, but also to the profession and to the lay public in general. Ideally, the aim of therapy is the eradication of disease. In rheumatoid arthritis, this has not so far been possible. Because of the nature of the disease, its unknown pathogenesis and erratic and unpredictable course, evaluations of therapy are difficult and hazardous. We do have evidence which is satisfactory to us that when the disease is viewed over a span of years, no therapy has modified its essential nature to an appreciable extent. Much can be done, however, to make the patient more comfortable, to decrease at least to some extent the ravages of the disease, and to guide the patient into a more useful and pleasant existence. We prefer to talk about the management of the patient with rheumatoid arthritis rather than about the treatment of the disease, rheumatoid arthritis.

In such a discussion, it seems inappropriate to consider the management of these patients in detail. Suffice it to say that, along with fostering the patient's general health, particularly in regard to nutritional problems, and his mental health by encouragement, the following specific measures seem appropriate:

1. The relief of pain and prevention of deformities, insofar as possible, by salicylates, general rest, and periodic immobilization of affected joints by splints, and by graduated active and passive exercise to minimize muscle atrophy and contracture.

2. If the above regimen does not seem adequate, gold compound therapy may be indicated and, if so, the patient must be carefully observed for signs of toxicity.

3. If the course of the disease seems rapid and the regimen described in (1) above is unfeasible because the patient must remain active, then thought must be given to hormone therapy, and all the risks involved in maintaining a patient on Cortisone or corticotropin over a long period must be weighed against their usual benefit in controlling symptoms. In making this serious decision the physician is obligated to consider the economic realities facing the patient. Sometimes the necessity that the patient continue to support himself and his family dictates that the calculated risk must be taken.

Work Record of 100 Patients

SINCE the evaluation of therapy in this disease requires above all the long-term horizontal study of a large group of patients, it is not practical at this time to discuss the work record of patients treated with Cortisone or corticotropin.

We have, therefore, analyzed the work record of 100 patients with rheumatoid arthritis of the peripheral type (ankylosing spondylitis was excluded) seen in our clinic. These patients attend an ambulatory clinic in a voluntary hospital in New York City. Thus, the patients with extremely severe disease and those of the very low income groups (who are more often seen in municipal hospital clinics) were probably excluded. The patients have received a variety of therapeutic regimens, salicylates, gold, and partial rest programs. None has received Cortisone or corticotropin. The incidence of females was four to one male. The disease was present from six months to 40 years, the mean being around 10 years. The ages varied from 26 to 83. For the purposes of this discussion in which occupation is our major concern, it seemed advisable to separate them into two groups—housewives, and those employed outside the home.

HOUSEWIVES: The work record of a housewife is difficult to analyze. Forty of these patients, however, were housewives, ranging in age from 26 to 67 with a mean age of 47. The disease had been present from six months to 25 years, with a mean duration of 12 years. They represented a fair cross-section of the disease: 50% had a positive agglutination against group A hemolytic streptococci, 88% an elevated erythrocyte sedimentation rate, and 33% represented severe rheumatoid arthritis, i.e., there was evidence of osteoporosis, cartilage and bone destruction, joint deformity and, in some instances, fibrous and bony ankylosis. However, when classified as to functional status, only 20% of the group were limited in performing the usual duties of occupation or of self-care, and none was wholly incapacitated, bedridden or confined to a wheelchair. All maintained that they were still housewives and did some housework. Seventy-five percent had dwellings consisting of more than three rooms, and 33% did all their own laundry, most with the help of a machine. Only two had any hired help, but 70% depended on some member of the family. It seemed to us that it should be of interest to this group that in the great majority of instances, this help came from the husband. This would represent an increased load on an employed person, since in no instance was the family of these 40 housewives on relief.

EMPLOYED GROUP: The group employed outside the home, which should bear a more direct relationship to our discussion, consisted of 60 patients, 19 males and 41 females, aged 27 to 83 (a mean of 53), with the disease for from one to 40 years and a mean of 10 years. They also represented a fair cross-section of the disease: 60% had a positive agglutination against group A hemolytic streptococci; 70% an elevated erythrocyte sedimentation rate; 35% had severe rheumatoid arthritis where there was evidence of osteoporosis, cartilage and bone destruction, joint deformity and, in some instances, fibrous and bony ankylosis. Here again only 20% were limited in performing the usual duties of occupation or self-care.

Of this group of 60 patients, 23 had continued their same occupation and 36 had changed their occupation because of illness. In 11 instances their present jobs represented downgrading as to income or the amount of work involved and five of these patients became housewives. Twenty stopped working and, of these, six were on relief. One patient never had worked. The occupational record of the group can be seen in the table comparing the pre-disease status with that found during disease (Table I).

It should be mentioned that, despite the downgrading some of these patients underwent in their occupational status, two-thirds were working on their feet, 20% worked six or more days a week, and 75% worked eight or more hours a day.

TABLE I.
OCCUPATIONAL STATUS OF 60 PATIENTS WITH RHEUMATOID ARTHRITIS AFTER THE ONSET OF THE DISEASE COMPARED WITH THEIR PRE-DISEASE OCCUPATIONAL STATUS

No. of Patients	Employment status after onset	Employment status before onset	
23 (38.4%)	Kept same job	factory work	(5)
		household help	(6)
		clerical work	(3)
		professional	(4)
		supervisory	(3)
		manual labor	(2)
11 (18.3%)	Positions downgraded to:	from:	
	domestic (2)	factory	(2)
	comptometer (2)	manual labor	(2)
	laundry folding	laundry pressing	
	station agent	subway conductor	
	watchman	porter	
	file clerk	stenographer	
	taxi driver	bricklayer	
	handyman	furrier	
	designer	carpenter	
5 (8.3%)	Became housewives	household help	(2)
		clerical work	(2)
		factory work	
20 (33.3%)	Not working	domestic	(7)
		factory	(6)
		clerical	(4)
		carpenter	
		tailor	
		watchman	
1	Never worked		

TABLE II.
EMPLOYMENT STATUS OF 54 PATIENTS WITH RHEUMATOID ARTHRITIS WHO HAD BEEN EMPLOYED BEFORE ONSET OF THE DISEASE, ACCORDING TO THE STAGE, FUNCTIONAL CLASS AND DURATION OF THE DISEASE

Number of patients	Employment status	Stage of the disease					Functional class			Duration of disease (in years)				
		early (I)	moderate (II)	severe (III)	ankylosed (IV)	no limitation (1)	slight limitation (2)	moderate or marked limitation (3)	incapacitated (4)	0-2	3-5	6-8	9-12	12+
20	Stopped working	5%	50%	40%	5%	5%	60%	30%	5%	15%	40%	15%	15%	15%
34	Continued working	14%	59%	21%	6%	35%	56%	9%	0	23%	21%	10%	23%	23%

After eliminating those who left employment to become housewives and the one patient who had never worked, this group can be broken down according to stage, functional classification, and duration of disease (Table II). The interesting observation is that there was little correlation between the severity, functional limitation and duration of the disease and the employment records of these patients. It is obvious that these data cannot be assessed statistically, but it seems reasonable to suggest from them that in a group of ambulatory patients we cannot distinguish by presently available objective or subjective criteria the patient with rheumatoid arthritis who will continue to work and by definition be employable from the one who cannot work. In this particular field, the term "motivation" which involves many disciplines is being discussed widely. Until it is further defined, it seems fruitless to talk about it.

If the problem of lack of motivation is overcome, some of the unemployed with this disease should be able to work at least at part-time positions. Fatigue is extremely detrimental to these patients, but a job which can be carried out without fatigue can be done in the presence of pain and deformity.

In conclusion, the patient with rheumatoid arthritis can be and is employed. To increase the number employed, efforts should be made to control pain and minimize deformities. Downgrading of jobs to require less of the individual is a feasible procedure.

The employability of an ambulatory patient apparently depends on some factor other than severity or duration of the disease.

Keeping the Patient with Gout Employable

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FROM the practical point of view of employment, gout is probably the least important of the rheumatic diseases because it is not as common as the others. However, one peculiarity about gout makes it stand out: it is as likely to affect the Board of Directors as those who work with pick and shovel.

There are two major aspects of the problem of keeping the patient with gout employable. The first has to do with prevention of *acute gouty arthritis;* the second with the prevention and treatment of *chronic tophaceous gout*, or chronic gouty arthritis. We are concerned only with the management of these disorders, not with cure. There is no cure for gout.

So far as can be determined, gout is an inherited disease involving some abnormality in genetic transference which results in a subtle disturbance in purine metabolism, characterized by hyperuricemia. The disorder remains clinically quiescent for many years; in males ordinarily until the age of 30 or 40, in females ordinarily until much later in life.

Treatment of Acute Gouty Arthritis

THE most characteristic manifestation of overt gout is acute gouty arthritis, an exceedingly disabling disease. In the early phases the disability is a matter of a few days or a few weeks. But with further progression, the attacks recur with ever-increasing frequency, usually persist for increasing periods of time, and leave more and more joint disability in their wake.

The problem of management of the acute attacks has been simplified in recent years by the introduction of two new drugs in addition to colchicine, the classical drug of treatment. These new drugs are ACTH and phenylbutazone. It is now a relatively simple matter to control the acute attack even in its more severe manifestations by proper use of one or more of these three agents—colchicine, ACTH, and phenylbutazone. There are comparatively few refractory responses to appropriate therapy.[1]

GUTMAN, ALEXANDER B., and YU, T. F.: Current Principles of Management in Gout. *Am. J. Med.*, 13:744 (December) 1952.

Prevention of Acute Gouty Arthritis

ACUTE gouty arthritis is always an erratic occurrence and one can rarely predict when the acute attack will occur. It is still not possible to prevent altogether the occurrence of acute gouty arthritis, but progress has been made in reducing the frequency and severity of attacks in most patients.

We have been testing a regimen that has been tried spasmodically over a good many years; namely, the regular administration of colchicine, in 0.5 to 2 mg. dosage, given prophylactically every day. Some 75 patients on such a regimen have been under observation for periods varying from one to five years. This regimen, which is simple to administer and which has not thus far caused any overt toxicity, together with more or less regulation of diet, apparently will largely prevent the occurrence of severe acute gouty attacks in most cases. At any rate, in approximately 80% of our patients now on such a regimen, it has been possible to keep the patient regularly employed, with few interruptions of productive activity. In at least 15 of these instances we were dealing with patients who suffered acute attacks with such frequency and severity as to preclude employment.

Chronic Gouty Arthritis

CHRONIC gouty arthritis due to tophaceous deposits can be very disfiguring, causing gross deformities of the legs, particularly of the feet, and of the hands. The best management is prophylaxis. We now have means for preventing the development of seriously disabling gout. These include dietary restriction and the regular use of a suitable uricosuric agent, medication that will increase the excretion of uric acid in the urine. Benemid is a uricosuric agent which can be given regularly month after month without eliciting an undue proportion of toxic symptoms. It will substantially increase the excretion of uric acid in the urine and maintain serum urate levels within normal limits in most instances.

Benemid is p-(di-n-propylsulfamyl) benzoic acid. It is given orally, ordinarily in doses of 1-2 gm. a

day. That is sufficient in most cases to increase the uric acid excretion 40 or 50%, and to put most patients in negative urate balance.

The unhappy side effects to watch for are:

1. Some gastric intolerance or discomfort, which can ordinarily be counteracted with bicarbonate.

2. Drug allergies. Fortunately these are not very common but they do occur. So far, there has been no hepatotoxicity and no bone marrow damage.

3. The physician must be careful not to give too much of the drug, particularly to patients with renal calculi, because the drug increases urate excretion and therefore favors the formation of urate calculi. By giving adequate amounts of fluid and a little sodium bicarbonate, that difficulty can usually be obviated. But in patients who have had many recurrences of stone, it is best not to give Benemid.

4. Finally, the drug has some propensity to provoke acute gouty attacks, at least in the first week or two of administration, and one must be on guard for that.

Such a program, in our experience so far, seems to prevent the formation of crippling urate deposits; at least we have not seen new tophi develop. And in joints which were quite immobilized and could be moved only with difficulty, we have often been able to effect considerable improvement and relaxation so that patients have been returned to useful occupations. It is possible in this way not only to prevent the formation of crippling gouty arthritis, but also to retard the further enlargement of tophi which have already formed. In some instances it has been possible to reduce the size of old established tophi and even to cause their disappearance, with consequent lessening of joint disability and swelling, particularly of the feet.

Indications for Use of Benemid

As to when Benemid is indicated, most patients with acute gout do not go on to develop really severe gouty arthritis. However, many will, over the course of many years of the disease, deposit appreciable amounts of urate in their tissues which may contribute to some joint stiffness and general disability, without progressing to the stage of really disabling gouty arthritis.

About 50% of patients with gout will eventually develop visible tophi, usually in the lobes of the ear or in the feet. I generally withhold the use of Benemid until I see some evidence of clinically significant deposition of urate, either the appearance of visible tophi, or the development of some joint stiffness. I would recommend that Benemid be withheld until there is some really good medical indication for its use.

How long to continue Benemid is a matter that can best be determined if the physician does routine analyses of the urine for uric acid excretion. The duration of increased urinary uric acid excretion, in response to Benemid, depends upon how much urate has been deposited in the tissues. In the earlier cases of gout, the amount is not very great —two, three or 10 times the normal, which is very small. Therefore, when the drug is given, for the first few weeks or months, there is increased excretion in the urine and then, although the drug is continued, the excretion drops back to the original figures. The serum urate levels, however, remain low, irrespective of the cessation of increased urinary excretion. If the physician feels there is something to be gained by maintaining lowered uric acid levels in the blood—and I think there may be, at least in chronic tophaceous gout—then he will continue the use of Benemid; otherwise he will discontinue it. What I do is to discontinue temporarily and allow the patient time to fill up again with urate, so to speak, and then re-exhibit the drug.

That is a matter of choice; we have no really good evidence for or against this procedure.

Keeping the Patient with Osteoarthritis Employable

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The present concept of systemic osteoarthritis is that it is an erosion of cartilage due to use, the speed of wear dependent somewhat on intrinsic unknown factors in cartilage metabolism, which vary its resistance to stress. As the bone loses its protective cartilage the bone reacts by sclerosis and hypertrophic excrescences. The synovia becomes irritated and hypertrophied, the capsule moderately inflamed. The involved muscles react by spasm due first to the fatigue of maintaining the joint as a mobile unit in spite of its disturbed mechanical efficiency, and eventually due to pain as well. The fibrous tissues adjacent and even at a distance must also withstand undue stress, and fibrositis develops. The pain is mediated through these soft parts, the joint components being relatively insensitive.

As the joint structures age, the supporting, mesenchymal, fibrous tissues also age. They become frayed and fibrillated and lose their tensile strength. They become irritated and tend to shorten, contributing to the limited mobilities characteristic of aging. This is a component of senescence not sufficiently stressed.

Symptoms from osteoarthritis demonstrable by x-ray may or may not develop. A considerable amount of osteoarthritis may not produce pain or appreciable disability. The two situations which produce symptoms are: (1) extensive osteoarthritis resulting in marked anatomical changes, and (2) osteoarthritis of any degree to which is applied trauma in one form or another.

Of these traumas, those sequential to poor body mechanics are numerically most important. This aspect involves most notably obesity, flat feet, physical and emotional fatigue states resulting in poor muscle tone, and the traumas sequential to orthopedic derangements.

Occupational traumas as from prolonged standing, poor seating, clumsy bench-chair relationships, repetitive movements, moving of unduly heavy objects, and poor lighting resulting in physical fatigue, are all factors producing trauma to joints, some-

times microscopic in their effects, sometimes dramatic.

Dynamic trauma also, direct and indirect, applied to an osteoarthritic joint, may set up a traumatic arthritis which may be present an unduly long time before the joint returns to its pre-traumatized state.

Keeping the Osteoarthritic Employable

I. MEDICAL—There must be recognition on the part of the medical profession, through education, of the viewpoint that osteoarthritis is a natural aging, the rate of aging influenced by the amount of use applied, and that the symptoms are usually due to an acute traumatic arthritis resulting from one of the traumas mentioned above. The treatment is basically the removal or mitigation of these traumas. The treatment is, in effect, medical orthopedics. Masking of the symptoms by analgesics or one of the "wonder drugs" merely postpones the day when the inevitable facts and sequelae of deranged body mechanics must be faced.

A brief outline of the medical management follows:

REST: General—The avoidance of undue activity. Local—Casts, braces, suppo ts, bandaging.

REMOVAL OF TRAUMATIC FACTORS: Static trauma, treatment of: obesity; poor general body mechanics; weak feet—orthopedic shoes, arches when indicated, manipulation, massage and corrective exercises. Dynamic trauma, avoidance of. Occupational trauma. Trauma from orthopedic disabilities.

ENDOCRINE FACTORS: hypothyroidism; hypo-ovarianism.

FOCAL INFECTION—Some physicians think that this is an important aggravating factor.

CIRCULATORY FACTORS—Arteriosclerosis. Treatment especially of the vasospastic factor by: vasodilators, contrast baths, warm clothing, treatment of varicose veins.

PHYSICAL THERAPY: Heat—warm baths, local and general whirlpool baths; infrared and luminous-ray lamps. Massage. Exercises to stretch shortened fibrous tissue structures.

LOCAL ANALGESIA (SALINE, PROCAINE): to local areas of tenderness; to involved nerves; trigger points.

II. SURGICAL—The second approach is *surgical*. Most surgical procedures tried in the past, such as synovectomy, have a usefulness in only small selected groups. Arthoplasty has some place, as in the treatment of hallux valgus. But the surgical approach most useful and certain is arthrodesis or fusion. A joint that is fused in good position is painless, and commonly a useful limb results. The most hopeless joint may be the one that can best be managed by arthrodesis.

III. PSYCHOLOGICAL—This approach is directed to the worker's attitude towards aging. With many adults there must be a personal revision of their psychological approach to aging, resistance to boredom and mental laziness, and a more receptive attitude to change. The earlier constructive drives, such as the rearing of a family must be replaced with new horizons. Too often these early drives are replaced by an over-indulgence in eating, resulting in the obesity of later life. All these factors and many more of the same sort are important in postponing the eventual collapse of effective body mechanics. Of them all, obesity is probably preeminent. It is considered that there are 25 million overweight people in the United States today of whom five million are definitely obese.

IV. INDUSTRIAL. The fourth technique involves *industrial management*. There must be a recognition by industry of the susceptibility of aging joints

Age-Old Disease

ARTHRITIS has been afflicting the human race since the beginning of civilization. The Romans recognized certain forms of hydrotherapy in the treatment of arthritis. This was evidenced by beautiful baths, built of stone and marble, near the locations of hot springs. The baths excavated at Bath, England, and Aix les Bains, France, contained warm water and sweating chambers made of stone, and they are partially intact to this day. During the 17th Century the treatment of rheumatism was largely in the hands of quacks, such as Mrs. Mapp, the "bone setter." She would ride three times a week from Epsom to London with six outriders in scarlet preceding her. Another, Sir James Jay, was knighted by George III of England. In 1676 Sydenham, partly as the result of personal experiences, separated gout from other forms of rheumatism. There was no difference between the treatment of gout and rheumatism during the 18th Century. The object in both cases was to depress the fever, if any, and to drain off the "acrid substances" which were assumed to be causative. A useful summary of the treatment of rheumatism in the first quarter of the 18th Century is given by Boerhaave. He states that rheumatism "is always cured by bleeding, cooling, repeated purges, ally'd at night with a narcotic; gently bathing in warm water, antiphlogistic fermentations, and blisters to the part; a thin spare diet, rest, the warmth of a bed, and toward the latter end by dry, hot frictions together with the use of antiscorbutics." This sentence is probably the first reference to massage in English medical literature. Latham, in his book (1796), was the first to state that "therapy must be adapted to the stage of the disease, and a knowledge of the normal." As the result of this new trend in therapeutics at the end of the 18th Century, most of the leading physicians came to adopt some form of "expectant treatment."

—C. STEWART GILLMOR, M.D., Kansas City; *J. Missouri S.M.A.*, 49:976 (December) 1952; quoted in *Ohio State Med. J.*, May, 1953.

and their supporting tissues to the traumatic effects of long standing, poor seating, repetitive movements and bad lighting. It behooves industry to take cognizance of these matters, because they increase fatigue and detrimentally affect work output. Also industry today is squeezed between reduced manpower and the necessity of using older people on the one hand, and the legal responsibility for their injuries on the other hand. The average industrial engineer too rarely considers these factors. He considers efficiency, and today accident prevention is uppermost in his mind. He must go a step further and plan his factories to cut down the daily wear and tear of prolonged standing, poor seating, inadequate lighting and moving unduly heavy objects, thus holding back both the development of osteoarthritis and the traumatization of joints which are already the seat of osteoarthritic change.

Keeping the Patient with a Shoulder Syndrome Employable

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THE shoulder area is subject to all of the diseases about which we have just heard, and of course, to many others. I am going to discuss a number of syndromes occurring at the shoulder which may start moderately and remain mild in minor disorders, but sometimes they soon take a serious and threatening turn which is a menace to the employability of the patient.

These disorders have a well deserved reputation for tenacity and long-standing disability because most of them tend to become chronic. They consist of: musculotendinous (cuff) lesions; calcific tendinitis or "bursitis"; bicipital tendinitis; periarthritis, also termed "frozen shoulder," periarticular fibrositis, adhesive capsulitis; and shoulder-hand syndrome, also called reflex dystrophy, Sudeck's atrophy, etc.

These entities contribute an important portion of the disabilities encountered in industry. In Dr. Bunim's statistical evaluations, "bursitis" alone constituted approximately 12% of the musculoskeletal illness and incapacity presented by employees in his study.

These conditions may do very well without any complicated therapy or management, and the patient may continue at work with simple assistance from the physician. Often at the beginning, if they are mild, they will clear up spontaneously. Very soon it sometimes becomes necessary to decide whether a well organized program of management and specific treatment is required.

As with the other disorders discussed in this Symposium, there are basic measures used in the management of these conditions when they become chronic. The acute ones are not great problems. They usually respond shortly, or in due time, but when they become chronic, they are really among the great challenges we face in the employability or re-employability of many of these patients with severe "rheumatic" or allied disorders.

The management and treatment of these cases require the application of those basic measures usually employed in any of the musculoskeletal disorders (Table I). The first principle is rest in some form, usually consisting of complete rest for the patient in acute conditions or, in milder onsets, the limited use of the extremity with the arm in a sling until the acute or subacute symptoms have subsided. During this period and later on, if the patient does not require both upper extremities for work and can get along at some sedentary occupation with only one good upper extremity, the problem of employability is not involved. If the patient can be reassigned to work so that he or she is able to get along with one good extremity for a while, then again the work problem is not troublesome. When the condition becomes chronic, or when it lasts for any great length of time, if the work is of such a nature that it cannot be changed temporarily, then we really have a very serious threat to that patient's economic welfare as well as to his or her employability.

In addition to the simple, basic therapeutic procedures, in severe, acute or unresponsive conditions, it soon becomes necessary to decide which specific measure we can introduce to shorten the disability, and to relieve the pain in a better way than the basic measures of rest, analgesics, and physical modalities.

There are a number of such useful measures, and I have given myself time to dwell on them because they really are the chief considerations in the management of these disorders when they become subacute or chronic (Table II). They include some of the old classic procedures: radiation therapy, procaine block, orthopedic surgery, and then the new "Land of Promise"—ACTH, Cortisone, and Compound F. Although experience in the application of ACTH, Cortisone, and Compound F in the management and treatment of these disorders is rather limited at this time, I think that in our hands, and

TABLE I.
BASIC, CONSERVATIVE MEASURES IN SHOULDER SYNDROMES

1. Limited use of extremity during painful period:
   - Complete rest for hyperacute symptoms
   - Arm in sling in acute and subacute, adducted; forearm and hand elevated
2. Analgesics:
   - Salicylates, 10-20 gr. q.i.d.
   - Acetophenetidin or Aminopyrin
   - Phenobarbital
   - Codeine or Demerol for severe symptoms
   - (Butazolidin?)
3. Physical Therapy:
   - Heat:
     - Home: infrared, electric pad, hot packs, liniment rub
       (Cold applications superior in some acute cases)
     - Office: diathermy
     - Hospital: underwater therapy, wheel and other devices
     - Spa: in refractory, selected cases
   - Special exercises

TABLE II.
THERAPEUTIC INDICATIONS IN SOME SHOULDER SYNDROMES

	Radiation Therapy	Procaine Block	ACTH Cortisone	Comp. F	Orthrop. or Surgery
Musculotendinous Lesions (Non-specific)					
Mild Tears	——	XX (locally)	——	?	——
Severe Tears	——	——	——	——	XX
Calcific Tendinitis (Subdeltoid Bursitis)					
Hyperacute, Acute	XX	XX (2 needle)	XX	X	——
Subacute	X	X (2 needle)	XX	X	——
Chronic	——	——	X	X	XX
Bicipital Tendinitis	X	X (locally)	——	——	X
Periarthritis ("Frozen Shoulder") (adhesive capsulitis)	——	X	XX	?	X
Shoulder-hand Syndrome	X	XX (stellate)	XX	?	XX

X — Effective XX — Superior —— — Ineffective

X — in selected cases ? — doubtful, or insufficient data for evaluation

from what we know of the observations of others, the trend of responsiveness of these conditions to these new preparations is such that we may soundly compare their effects with the results of the established methods.

The musculotendinous lesions may be non-specific like periarthritis and these, therefore, need no special comment here. They may be traumatic lesions which usually are self-evident and will not be discussed further. The troublesome disorders, those that most frequently threaten the patients' well-being, are calcific, subdeltoid tendinitis of the shoulder, bicipital tendinitis, periarthritis, and the shoulder-hand syndrome. Every one of these conditions is a real challenge to the restoration of function, to the control of pain, and to the employability of the individual.

I will now give a brief comparative evaluation of our present therapeutic resources based on our own material and what we know of the experience of others. We find that calcific tendinitis may be divided into three groups, because each one represents a different type of problem, as to the employability and as to the specific treatment, in order to get the patient comfortable and back to work.

The acute, subacute, and chronic forms of calcific tendinitis (or "bursitis"), as shown in Table II, vary in their responsiveness to each of these therapeutic procedures. Here we may well speak of treatment as well as management. The acute or hyperacute condition, in our hands, has been equally responsive to the three methods of approach indicated as XX in the Table. It becomes a matter of good judgment with the physician, after he has started the patient on the basic procedures, to decide the opportune moment when he must step in with one or another of these aids for the particular individual.

The hyperacute or acute calcific tendinitis is likely to make a spontaneous recovery, if we can only keep the patient comfortable long enough. However, sometimes the patient clamors for relief. We feel at the present time that probably the most conservative and the simplest approach is radiation therapy. One of the most rapid and spectacular methods of treatment seems to be ACTH or Cortisone. Before taking a positive position, we prefer to wait until more experience has accumulated on the application of these compounds to this particular disorder. It looks very promising. The period of administration is short, and probably many of the objections to the use of steroids in chronic conditions will not occur here. I might add further that the two-needle irrigation is probably as quickly effective a therapeutic procedure as any, and usually the most thorough, to make the patient comfortable; however, it has the objection that these patients are in great pain, and to carry it out with due regard for the patient's discomfort, it should be a hospital procedure done under intravenous anesthesia. It should be reserved as the last resort in this category, unless the other approaches are not feasible or are contraindicated.

Subacute tendinitis is another problem. It does not respond to either of the above procedures as well as the acute does. We find in our limited number of patients so far that the results promise to be the best with the use of ACTH and Cortisone.

In chronic calcific tendinitis, it seems that even the less impressive effects in the subacute form do not apply. Probably the best of these procedures is the use of ACTH and Cortisone in selected cases. These substances are such potent weapons, however, that we feel they are not indicated except under unusual circumstances, particularly in the extended administration which may be required.

When there are multiple deposits, or an inaccessible or stubborn one, and function is impaired, the best solution is surgical excision.

For the place of Compound F in all of these conditions, I might make a combined statement. It may prove to be the most rapid and effective method of treating calcific tendinitis in any form, but it carries the unpleasant hazard that the more accurate the marksmanship in applying the material to the involved tendon, the more likely is an acute exacerbation to be provoked. If the patient is willing to accept the possibility of about 24 hours of misery worse than what he has suffered before the treatment was applied, then this may prove the best of the methods of controlling any of these conditions in individual cases.

Bicipital tendinitis can be a very troublesome ailment. It does not respond as well as acute calcific tendinitis, for the simple reason that it usually is a low-grade process. It behaves much like the subacute or chronic disturbance when the supraspinatus tendon is involved. Choice of therapy is dependent upon the decision of the physician as to how soon the disability and the pain require specific measures for their control. In our experience, local procaine infiltration is the simplest and most easily applied. Others prefer radiation therapy. In severe cases in due time it becomes necessary to resort to orthopedic surgery.

Periarthritis of the shoulder, or the "frozen shoulder," is one of the really stubborn problems and one of the greatest threats in the whole list to the patient's employability and comfort. We have found, to be brief, that ACTH and Cortisone apparently give more rapid and better effects upon the pain and upon the function of the shoulder, in some cases, than any of the other procedures that

we have used. However, the outcome is not always predictable, and in those patients who failed to respond we found that, when manipulation was combined with maintenance on these compounds, we got results where they alone had been ineffective or where manipulation alone previously had not produced adequate response.

In the shoulder-hand syndrome we have found two procedures almost equally effective: the use of stellate ganglion block and ACTH or Cortisone. The long-range use, or at least a fairly long-term prescription over three to six months, necessary to maintain the result, presents the hazards associated with the administration of these compounds for any great duration, and the possible complications. These do not occur with stellate ganglion block. Once a patient gets relief of pain, once he derives adequate mobility, there is no need for further treatment and recurrences have been 2% in our series so far. There are no contraindications to blocks that we know of except the patient's hypersensitivity to needles or to the medication.

When neither of these procedures, steroid therapy or sympathetic block, is effective as additive treatment to basic management, then sympathectomy is indicated, if the shoulder-hand syndrome is not too far advanced and if the patient is fit for it.

FINALLY, in summarizing, I must add that in these disorders keeping the patients employable often depends not only on the treatment, but also, as has been mentioned, on the mental attitude of the patient. Sometimes the ability and willingness of the employer to rearrange the patient's duties, temporarily or for an indefinite period, contribute greatly to solving the problem.

From what we have observed from applying basic therapeutic measures to shoulder syndromes with or without accepted special procedures, according to the needs of the situation, a great deal can be accomplished for comfort and restoration of function. With the range of selection now permitted by our new and growing therapeutic resources, we believe it will become increasingly possible to keep more and more of these patients employable or reemployable by more effectively and more rapidly relieving their pain and preventing or overcoming their disability.

The Patient with Extra-Articular Rheumatism

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ALL RHEUMATIC diseases can be divided into two parts: those that involve the joint structures directly, which are different forms of arthritis; and those that involve non-articular connective tissues. The terms, "extra-articular rheumatism," and "non-articular rheumatism," apply to a large group of disorders that have the common denominators of pain in, and stiffness of, connective tissue near but outside the joint. These disorders are called forms of "primary non-articular or extra-articular rheumatism." There is non-articular tissue disease associated with any systemic rheumatic diseases that involve the joints, such as rheumatoid arthritis or osteoarthritis. There is involvement of non-articular connective tissue—and this we call "secondary" non-articular rheumatism. This discussion will concern only primary non-articular rheumatism.

Primary non-articular rheumatism may be quite generalized, involving a great deal of the connective tissue in the body, or it may be localized to certain special structures.

Generalized non-articular rheumatism is often called "fibrositis" because different types of fibrous tissue are involved. Patients who have fibrositis may have stiffness and pain in the back and in parts or all of the extremities. There is tenderness at the tendon attachments themselves and the sheaths in which they move. Many other fibrous tissue structures may be involved in this type of non-articular connective tissue disease. Often it is a chronic disorder.

There are also localized forms of non-articular rheumatism which may involve only a small region of the body, around the shoulder, neck, back, elbows, wrists, fingers, knees, or ankles. These forms are usually acute and short in duration. Examples will be discussed presently.

Another type of rheumatism largely non-articular but sometimes involving the joints is called "psychogenic rheumatism," or "the rheumatic manifestations of psychoneurosis."

General considerations of non-articular rheumatic diseases revolve around two points:

1. The physician must differentiate this type of disorder; and

2. He must correlate the dysfunctions and the discomforts of this type of rheumatism with the type of work the patient is doing.

As a group the non-articular rheumatic diseases are minor illnesses. They do not have the importance of some forms of arthritis. They seldom produce permanent dysfunctions, deformities, and crippling. If there is any disability or dysfunction, it involves a relatively small part of the body.

Physician's Responsibility

THE primary importance of this group of diseases is that they cause pain and discomfort in the part of the body affected. They are nuisance diseases, and for that reason are less important from the standpoint of workability or employability. There is a difference between these terms. A person may be employable and have a certain amount of absenteeism because of illness, or he may be unemployable because of chronic disability. Seldom do any of the non-articular rheumatic diseases cause unemployability, but they may cause absenteeism and inability to work.

The physician's responsibility is to recognize and differentiate this type of disorder from the major rheumatic diseases and to reassure the patient that

he is suffering from a nuisance disorder and not a serious disease. When a patient begins to have pain around a joint he is apt to think, "I have arthritis and am going to be disabled. I must resign my job and take to a wheel chair." It is an injustice to the patient to allow him to suffer from this anxiety when he has only non-articular rheumatism.

It requires astuteness on the part of the physician to differentiate psychogenic rheumatism but it usually can be done, and it is important to do so. The physician should attempt to remove any emotional conflict which may be the cause of the condition. When this is possible, the patient is relieved. If not, the condition should be rationalized so that the patient is relieved to the greatest extent possible.

A sincere and sympathetic attitude on the part of the physician, with a matter-of-fact approach, is most appropriate. Sometimes the help of a psychiatrist is of great value.

Stress-Producing Work to be Avoided

ANOTHER concern of the physician is to maintain normal function of the affected part, or as nearly normal as possible, during the time the patient has discomfort or disability from the rheumatic disorder. If dysfunction is present it should be corrected. If an individual has a *chronic* non-articular disorder, a change of work to fit his capacity may be required. For instance, if a job requires a person to operate a machine in a way that results in repeated strain or trauma to a certain structure where there is bursitis or tendinitis, he should be relieved of that operation and given work that does not produce that particular strain.

Generalized fibrositis often is aggravated by dampness and cold. A person with this type of rheumatism should not work in a refrigerator car or a butcher shop which requires frequent entry into a walk-in refrigerator; instead, it would be better for him to work in a drying room, a kiln, or in some occupation with that sort of environment. Likewise, a person who has chronic ankle strain should not do work that requires ladder climbing that will aggravate the disorder.

Problems in Downgrading Jobs

IN TRANSFERRING the worker from his job to lighter work more favorable to his illness there is the problem of how his pay rate will be affected. Seniority rating also may be involved. The result is that his union may oppose the transfer, in spite of the fact that the doctor advises it for the worker's welfare. Or, management may oppose the change because it is unwilling to incur the displeasure of the union.

In such situations the physician needs carefully to avoid any position with regard to labor or unions, and needs to consider the patient with a (mild) non-articular rheumatic illness as he would a patient with a chronic respiratory disorder that provokes discomfort, dyspnea, cough, or other respiratory troubles sufficient to cause absenteeism. If these conditions bother the worker enough, he will want to change his work, and he will make some adjustment with the employer as to that change. If a man has a major gastrointestinal illness, he may need to quit work, and perhaps never work again; however if he has a minor ailment either he will change the way he lives and get along with it, if it cannot be cured, or he will continue to have difficulties. Similarly, the person with a mild rheumatic disease must compromise. If he is unfortunate enough to work for an unreasonable employer or if labor management is unreasonable, he is caught in trouble.

Treatment of Primary Non-Articular Rheumatism

THE bulwark of treatment consists of different forms of physical therapy and analgesic medication. Occasionally special forms of treatment are appropriate.

Physical treatment should be readily available on a day-to-day basis, at the shop or in the patient's home if possible. Simple forms of heat applications, of massage and exercises to improve function, will often times overcome most of the difficulties and allow the patient to continue his usual activity.

Analgesia should be accomplished by the wise use of non-narcotic medication, chiefly salicylic acid derivatives. For chronic forms of non-articular rheumatism, narcotics are not appropriate, and should be avoided.

For such mild disorders as are often encountered in patients with non-articular rheumatism usually the benefits of Cortisone and Corticotropin do not warrant the potential difficulties obtaining with their use. However, for local acute non-articular rheumatic disorders Cortisone or Corticotropin used systemically or hydrocortisone acetate used locally may be appropriate and helpful.

Special Forms of Fibrositis

CERTAIN special forms of non-articular rheumatism should be mentioned. Bursitis may occur in many different places, not only at the shoulder but also at the elbow, hip, knee, heel or toes. Aspiration, temporary immobilization, the use of x-ray therapy, the instillation of hydrocortisone acetate in the inflamed bursa are all good measures of treatment, selected individually as the situation indicates.

Tendinitis may occur at the shoulder, elbow, heel and other places, and may be calcific or non-calcific.

The tendon attachment syndrome at the elbow—so-called "tennis elbow"—is quickly relieved with x-ray therapy, local propane, short immobilization, followed by progressive upgraded exercises.

Localized tenosynovitis can be treated similarly, and in addition the local instillation of hydrocortisone acetate (if the physician can get into the inflamed space), may add significant benefit.

Trigger fingers sometimes are helped by operations to relieve the obstructive tenosynovitis or tendinitis.

Excision of a Baker's cyst in the popliteal space at the knee may be needed if conservative measures have not been successful.

Relation of Focal Infection to Fibrositis

THE question has been asked, what part focal infection plays in the production of fibrositis in the lower back. The popularity of the focal infection hypothesis in relation to different types of rheumatic disease has reduced greatly in recent years, chiefly because careful study has indicated that there is little relationship between rheumatic disorders, of either systemic and local character, and any previous or existing localized infection. Moreover, removal of localized infec-

tion, such as infected tonsils or teeth, has for the most part failed to alter favorably the course of chronic fibrositis. Seldom is one able to determine whether an acute disorder that naturally would tend to subside, is benefited if a localized infection is removed. Recent antibiotic drugs known to be helpful to eliminate certain types of infection, do not benefit the patient with a chronic non-articular connective tissue disease.

Some persons develop fibrositis following a known localized infection. It may be that in these cases the infection acted as a "trigger mechanism." But there is little evidence that successful treatment of the infection in the person with subsequently developed rheumatic disease, is helpful for the rheumatism. Removal of "focal infection" should be considered more from the standpoint of prophylaxis than therapy.

General Prophylaxis

THERE can be well directed guidance of the patient to help prevent recurrences of non-articular rheumatic disease. It is helpful to avoid recurrent infections, unnecessary exposure to inclement weather, and fatigue; all of these may provoke changes in the body, resulting in recurrence of the rheumatic disorder.

Summary

THE physician should know the nature of non-articular rheumatic disorders, and their potentiality to cause disability or unemployability, and he should consider the type of work the individual does. Usually it is not a question of whether the non-articular rheumatic can work; rather it is a question of whether the job is one which he can do *with* his rheumatic disorder with little discomfort, and small chance of exacerbation.

As a group, these are mild disorders and the patient should be impressed with the relatively good prognosis in order to dispel his fear of disability. Conservative general treatment measures are beneficial; special treatment sometimes can hasten the resolution of these diseases.

Keeping the Patient with Low Back Pain Employable

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EVERY year, hundreds of thousands of man-hours and millions of dollars are lost to industry because of chronic low back pain. Although, a good percentage of time and money loss is attributable to muscle strains of transient duration and to low back pain due to such chronic diseases as tuberculosis, metastatic tumors, rheumatoid arthritis, etc., we consider the real diagnostic and therapeutic challenge to be that of the so-called "problem back."

It should be the goal of all physicians, especially the orthopedic surgeons and the industrial specialists, to restore, and, if possible, maintain the employability of these chronic sufferers. Unfortunately, the medical profession doesn't always lend the most thoughtful and intelligent evaluation to these cases. Too frequently these patients are classified as malingerers or neurotics who deserve little sympathy and less definitive treatment. Yet many of them continue on the job without loss of time despite considerable discomfort. In the beginning, at least, it is essential that the patient be given the full benefit of the doubt and his complaints accepted in good faith. In addition to a complete history and physical examination, the chronic low back sufferer deserves a thorough orthopedic examination and x-rays of the lumbosacral area. This constitutes a minimal work-up.

Too often our thinking is directed toward laborers and other manual workers when low back pain is being evaluated. However, office workers and the executive group are frequently victims of low back pain, too. Confronted with a condition which affects and incapacitates all groups of employees—from executive to laborer—it is obvious that consideration of the mechanism of low back pain is not in the realm of the philosophical or ultra-scientific.

The lumbosacral region is the site of origin of almost all low back pain and although sacro-iliac joint involvement is frequently considered, it can safely be said that disease here is uncommon. We have only to recall the transition from traveling "on all fours" to the upright position, to appreciate the great stresses to which this otherwise relatively unchanged lumbosacral joint is subjected. The most important factor at this joint is the slant of the sacrum. A lumbosacral angle must exist; the normal range being between 14° and 40°. The size of this angle is a good index of the strain on the ligaments, produced by the weight of the superincumbent trunk as the angle reaches 60° to 80°.

Two main muscle forces act on the joint to protect it from sudden movements and prolonged static stresses that might cause pain. These are the abdominal and gluteal muscle groups which are coordinated antagonists functioning to effect a leveling of the pelvis with corresponding changes in the lumbosacral angle. It is in the concept of muscular compensation and decompensation that the liability to lumbosacral strain of white-collar employees and others leading a sedentary life, becomes apparent.

Weakness of the abdominal musculature and/or marked obesity may result in a muscle imbalance causing a tendency to increase the lumbosacral angle with consequent strain on the ligamentous structures. Witness the back pain and discomfort of a pregnant woman near term. The relief of this type of lumbosacral pain is self-evident. To reduce the extra stress on the ligaments to the point of tolerance, abdominal and gluteal muscle strengthening exercises must be instituted, accompanied by a suitable diet for obesity if this is an associated factor. Braces and belts are designed to accomplish this by replacing or supplementing inadequate support with mechanical support.

Among the many anomalies of development in the lumbosacral area, much is said about the asymmetrical posterior articulations. It so happens that there is a very definite relationship of these articular facets in the upper portion of the spine but at

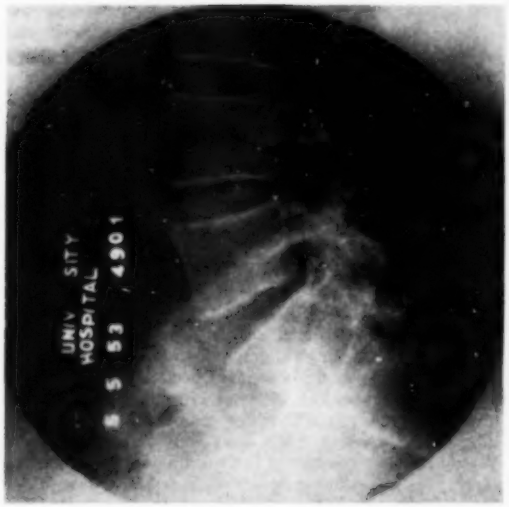

Fig. 1.
Posterior displacement of 5th lumbar vertebra on sacrum. Excessive lumbosacral angle. Intervertebral disc has been removed. Spine fusion stabilizing the 5th lumbar vertebra on the sacrum is shown posteriorly.

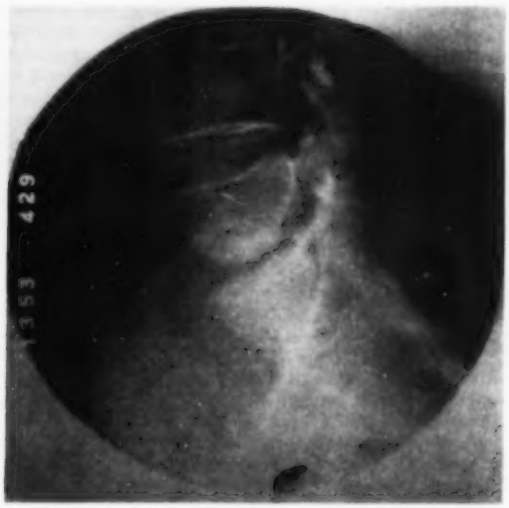

Fig. 2.
Bone destruction and posterior displacement of 5th lumbar vertebra secondary to incipient infection of disc space following removal of a herniated disc. There was onset of constant low back pain and bilateral sciatica on the ninth postoperative day.

the lumbosacral joint there is often marked variation. Frequently, the x-rays reveal a definite asymmetry between the right and left sides of the posterior lumbosacral articulation. Many clinicians and investigators theorize that this condition makes for poor mechanics in the physiology of motion at these joints. They conclude that because of this, the back will "wear out a little sooner." This is a reasonable hypothesis but some doubt must be reserved in this regard.

It is also not uncommon to demonstrate six lumbar vertebrae in a tall thin person complaining of low back pain. The extra vertebra is indicative of nothing except a tendency towards instability which is usually enhanced by inadequately developed musculature. Transitional vertebrae are also frequently indicated as the cause of low back pain, but the mere fact that such a vertebra is attached to the sacrum with a false joint does not justify this indictment. The motion in this joint is usually little or none. Here again is an example of anomalous development in this region, and the pain usually comes from the joint immediately above.

Spondylolisthesis is another cause of instability of the low back which is at times extreme. Because of a bony defect in the lamina of a vertebra, usually L-4 or L-5, there is no union between the body of the vertebra and the posterior elements This permits a forward slipping of the body of the upper vertebra on that of the lower. The resulting stress and strain on the ligaments is productive of all degrees of low back pain. The forward slipping is clearly revealed in a good lateral x-ray of the lumbosacral spine. Oblique views will demonstrate the laminal defect to better advantage.

Posterior displacement of the 5th lumbar vertebra on the sacrum due to relaxation of the joint is now a common and well recognized entity. This was a highly controversial subject not too many years ago—but then the pathology and mechanism of disc disease were little understood. In this condition, a diminished interspace is almost always evident on x-ray. The train of events is actually the result of an unstable vertebra. Owing to this instability and the associated ligamentous relaxation, the added stress on the disc produces degeneration of the disc material (nucleus pulposus) and its cartilaginous envelope with subsequent herniation. Disc material does not protrude forward, owing to the barrier presented by the strong anterior ligaments. Posterior herniation may or may not result in nerve root impingement and the development of the typical sciatic syndrome. Simple excision of the herniated nucleus pulposus in this situation is not the complete solution of the problem. We are still confronted with an unstable vertebra which may in itself cause low back pain. The pain is produced by the excessive motion and the extra stretching of the intervertebral ligaments due to the backward settling of the vertebra incident to the gradual collapse of the disc. The backward settling also distorts the normal relationship of the posterior articulations, which produces pain and ultimately arthritic changes. It is interesting to note that some people experience temporary relief from disc disease simply by lying down. This may be explained by the fact that a degenerated disc which is still encapsulated and restrained by the surrounding ligaments may bulge outward with weight bearing. Stretching of these ligaments produces pain. It is also possible that this encapsulated bulge may impinge on a nerve root. In this instance, the disc syndrome may be relieved by bed rest.

Manipulation also has its place in the management of the disc type problem back. Its greatest success is in the type of disc mentioned above where there is a bulge but no actual protrusion. Manipulation may shift the bulge so that pressure on the nerve is relieved. However, if the disc material has

herniated through the capsule and a fragment is lying out in the foramen against a nerve root, the patient will almost certainly be a victim of an intractable sciatica. This patient cannot get well in a reasonable length of time on conservative therapy. Many years of discomfort and futile diathermy may be his lot when simple removal of the herniated disc may completely restore his employability.

Unfortunately, every disc syndrome is not cured by simple excision of the extruded disc. If there is an associated low back instability, a stabilization procedure must follow disc removal. A lumbosacral angle of 50° to 60° is tantamount to trouble. The foramen is necessarily narrow and since it is normally smaller than the L-4, L-5 foramen, only a little displacement in the L-5-S-1 area can give a great deal of trouble. If there is any evidence of displacement, stabilization must follow disc removal. It may be noted that 15% to 20% of all lumbosacral disc operations not followed by stabilization will present persistent symptoms.

In some cases the excision of the herniated disc has been followed by persistent back pain which upon investigation by sedimentation rate and x-rays was found to derive from a low-grade osteomyelitis. This involved the inter-space previously explored and gradually destroyed the adjacent vertebrae body surfaces. Owing to the site of the infection, it is usually a slow process, and fortunately most of them clear up spontaneously. A stabilization performed at a later date may insure against recurrence of infection and may obliterate a joint that may well become arthritic later.

The best and only satisfactory method of stabilization of the back is by the spine fusion operation, which is unfortunately held in disrepute by many. It has been performed on many patients, some of whom have failed to get well. The paramount reason for the failure to cure was that the spine fusion did not "take," i.e., a solid fusion did not result. To relieve symptoms the fusion must be solid or the back is not stabilized.

In order to get a fusion, many procedures and contrivances have been devised. Some surgeons have tried prolonged immobilization. Others have laid down extra bone. Others have tried screws or plates for fixation. Various designs of pieces of hardware have been invented to stabilize the fusion area postoperatively and permit the bone grafts to "take." To our misfortune, this hardware helps little, if at all. As a matter of fact, experience has shown that the screw type of fixation actually doubled the incidence of failure. The best results in our opinion, are being achieved by doing a very thorough Hibbs type operation. Briefly, the procedure consists of splitting and interweaving attached spicules of bones from adjacent spinous processes and laminae and destroying the posterior articulations. It is most important to create an interwoven network of bony shavings which remain attached to their base. Additional bone may be added to this bed of raw bleeding bone. About 7% to 8% of failures at the lumbosacral joint result from this type of fusion. Regardless of the time spent in bed, whether it be two weeks or 10, a properly done Hibbs operation will achieve successful fusion in over 90% of the cases. It must be emphasized, however, that extension of the fusion will cause a high jump in the failure rate. When the 4th lumbar vertebra is included, about one in four fails.

What does all this mean? Our concept of the low back pain problem has changed a great deal in the last 15 years. Most low back pain does not come on as the result of an injury. It will eventually come on anyway. Most of the time, the injury just hastened its onset. That particular lift was not the cause of the herniated nucleus pulposus which produced the disc syndrome. It was the straw that broke the camel's back. Unfortunately, the labor laws give no consideration to the employer who happened to have that man in his employ at that particular time when the straw was added that caused the final break.

You can see from our review that there are several types of common backache. There is the postural type where we can visualize the obese individual with the protruding abdomen, the lumbar lordosis and the increased lumbosacral angle, or the woman with the protuberant abdomen, lumbar lordosis, and muscular weakness. That type of back gives a nagging tired feeling with occasional catching pain. What is the treatment? The answer is not the diathermy machine, nor the lights. Many misguided physicians, through their lack of proper evaluation of a case of low back pain due to muscular decompensation, administer diathermy week after week, month after month. In the end, they haven't done a thing towards curing the patient except to give him a little rest. If the patient gets well under this treatment, he would have gotten well without seeing a doctor. The diathermy machine is not a panacea for back pain and will never replace intelligent diagnosis and therapy. It bleeds the patient financially and fosters in him a sense of futility and pessimism when relief is not forthcoming. The patient has been "kidded along," and money has been obtained under false pretenses. In short, much harm has been done.

The real cure lies in exercises to attempt to compensate that lumbosacral joint by strengthening the abdominal and gluteal muscles. It is certainly justifiable to institute and supervise such exercises because many people are lazy and have constantly to be encouraged. This calls for a good evaluation of each patient and a plan to follow the doubtful ones closely.

Precautions should be taken to graduate the exercise program because at the outset an unduly ambitious one may create exacerbations. Eighty to 90% of the people with back pain who enter a physician's office are on a postural or static basis, and 80% to 90% of these can be cured or vastly improved by exercise and good medical management. The group that cannot be, has to depend upon support or else these patients must have their spines stabilized. Guard against the attitude: "she is a woman; she has all kinds of trouble; probably has trouble at home." She may have trouble at home, but it has nothing to do with the backache from which she may be suffering most of the time. Trust people and give them the benefit of the doubt. You will be right more often than wrong.

In contrast to the previously described nagging backache, there is the type that is sudden in onset. This type is usually characterized by repeated attacks, and eventually there may be pain down the leg. The treatment is primarily rest. Heat has a place here, too, but rest is paramount. These conditions requiring bed rest are usually manifested clinically by a flat back, listing of the trunk, or

reversal of the normal lumbar lordosis. Rest, sedation, and heat constitute the therapy during the acute stage. When the patient is again able to be up-and-around, diathermy in the office is not the proper follow-up. At this point, the patient will be helped by a belt. When the spasm has subsided light work should be encouraged and heavy work may be resumed in about two months. If there is a return of acute symptoms, conservative therapy must be curtailed because the possibility of effecting a cure within a reasonable time is remote. The disc should be removed. It is a simple operation and is successful in about 80% of the cases. The question whether to stabilize the spine at the same time invariably arises. Only a thorough analysis of the individual case can answer this question. Where there is a posterior displacement, a spondylolisthesis or a marked lumbosacral angle, there should be no hesitation in performing a Hibbs spine fusion.

We feel that most people with back trouble can be restored to productivity if they are given proper treatment. And prerequisite to proper treatment is careful evaluation of the all-too-common backache.

Medical Recording of the Rheumatic Diseases

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Consolidated Edison Company of New York

CHRONIC arthritis accounts for a sizable percentage of the total and permanent disability from disease in industry. Therefore, the industrial physician should be vitally interested in the detection of the early signs of rheumatic diseases; the prevention, if possible, of their crippling effects; and the rehabilitation of the employee disabled by such conditions. The accurate recording of clinical findings and their proper classification will materially assist the industrial physician in this program.

Fortunately, the industrial physician is, for several reasons, in a unique position to study and make record of the effects of disease. A relatively large percentage of well people come within the scope of activity of the industrial medical department in pre-employment, periodic and other special examinations. The Company Sick Benefit Plans and more recently the State Disability Laws often require examination by the industrial physician to evaluate the certification of sick absenteeism. Because of its availability, employees will often visit the industrial Medical Department for minor complaints which may be the precursors of disease and for which they ordinarily would not seek medical advice.

Consolidated Edison Recording Practice

SINCE 1947 the Medical Department at Consolidated Edison has recorded on I.B.M. cards the medical conditions which are associated with sick absence. In 1949 we began to include all medical diagnoses, even those unassociated with such absence. The medical diagnosis is listed by three digit code numbers which cover the various body systems. In 1949 the illness code for rheumatic disease was augmented to include specific conditions as classified by the American Rheumatism Association, and since then our recording has been more accurate.

The statistics with reference to rheumatic diseases based on the figures from 1947 to 1951 inclusive indicated an annual average of 310 cases of rheumatic disease accounting for sick absence averaging 4,200 work days per year. The average number of employees during that period was 25,000.

Review of Records by N.Y.U.—Bellevue Study Group

A PRELIMINARY review of our medical records by the Study group on Rheumatic Diseases of the N.Y.U.—Bellevue Medical Center has been of great value to us. This Study Group under the guidance of Dr. Joseph J. Bunim and including Dr. Robert Brown and Miss Claire Lingg, has examined sample medical records in the past year. We are pleased that they felt that the clinical histories in our Diagnostic Unit reflected high standards of medical practice and would be of real value in their study.

Even under these conditions, however, when a 10% sample of 1,500 records bearing a diagnosis of rheumatic disease was reviewed, it soon became apparent that it was not possible to confirm 43% of the diagnoses on the basis of the recorded data. The greatest impediment to the confirmation of these diagnoses was the lack of recorded findings of physical examination of joints. This was particularly true in the diagnosis of rheumatoid arthritis, in which instance it was felt by the reviewing team that joint disease was not present in nearly one-quarter of the cases. Conditions such as bursitis and myositis seemed to be involved rather than rheumatoid arthritis.

Faulty Diagnosis a General Problem

OUR experience indicates that failure to diagnose rheumatic disease correctly also exists in general dispensaries and hospitals. As we review the medical certification of illness presented by employees, we realize that the faulty diagnosis of rheumatic disease is a general problem. Two factors contribute to diagnostic errors:

1. Failure to follow the diagnostic criteria listed for the specific rheumatic diseases; and
2. Failure to utilize relatively simple laboratory procedures that would assist in correct diagnosis.

Although the following is incomplete, it will be helpful to list the diagnostic criteria* for some of the more common rheumatic diseases.

CRITERIA for the Diagnosis of Hemolytic Streptococcal, Pneumococcal, Straphylococcal and Meningococcal Arthritis:

1. A recent acute suppurative lesion due to the corresponding coccus.
2. Presence of fever and leukocytosis.
3. A positive blood culture and other evidence of the presence of bacteremia or systemic infection due to the corresponding coccus.

*As they appear in the "Manual for Arthritis Clinics," published by the Arthritis and Rheumatism Foundation in cooperation with the Institute of Arthritis and Metabolic Diseases of the National Institutes of Health, 1952.

4. Involvement of one or several joints which rapidly develop effusion associated with acute pain and tenderness.
5. Frankly suppurative synovial exudate on aspiration.
6. Bacteriological isolation of the microorganism from the joint.
7. No striking response to antirheumatic drugs or colchicine.**
8. Frequent prompt response to antibiotics (parenteral and intraarticular).
9. Roentgenologic findings: Early; soft tissue swelling, synovial effusion and osteoporosis. Late; destruction of cartilage and bone.

CRITERIA for the Diagnosis of Gonococcal Arthritis:

1. A gonococcal infection usually within recent weeks.
2. Frequent involvement of several joints at onset settling later in one joint. Periarticular swelling and tenosynovitis are usual.
3. Demonstrable gonococci in cervical or urethral smears or cultures.
4. Bacteriological isolation of gonococci from the joint fluid. Negative if the process is periarticular.
5. Positive gonococcus complement fixation reaction (particularly significant if reaction changes from negative to positive during the course of disease).
6. No response to antirheumatic drugs or colchicine.
7. Frequent recovery or improvement with antibiotics.
8. Roentgenologic findings: Early; soft tissue swelling only. Later; rapid destruction of cartilage.

CRITERIA for the Diagnosis of Tuberculous Arthritis:

1. Chronic involvement of one, or, more rarely, several joints with indolent swelling, warmth and bogginess, but frequently marked pain and tenderness. Regional muscle atrophy a prominent and relatively early finding.
2. Frequent association with tuberculosis elsewhere in body.
3. Demonstration of tubercle bacilli in synovial exudate by smear, culture or guinea pig inoculation.
4. Demonstration of tubercles in synovial biopsies.
5. Tuberculin test strongly positive. (Negative test more significant in ruling out diagnosis of tuberculosis.)
6. No response to antirheumatic drugs, or colchicine.
7. Roentgenologic findings.
   (a) Early: Soft tissue swelling, synovial effusion and thickening, with localized osteoporosis.
   (b) Late: Destruction, with tendency to spare the weight-bearing surfaces.

**Antirheumatic drugs may cause fall in temperature, but do not influence the arthritis. Adequate doses of antirheumatic drug for diagnostic test is aspirin or sodium salicylate, 7 to 10 gm., daily (or aminopyrine, 0.6 to 0.9 gm. t.i.d.) for one or two days. Adequate dose of colchicine is 0.6 mg., every hour or two for six to eight doses, or until diarrhea appears. Dosage schedule may be repeated on day following if no relief.

CRITERIA for Diagnosis of Syphilitic Arthritis:

1. Chronic involvment of one or several joints, often with marked swelling, but little pain.
2. In children, the stigmata of congenital syphilis.
3. Osteochondritis, including epiphysitis and synovitis with marked swelling (usually symmetric and painless) are common findings.
4. Positive serological test for syphilis.
5. Positive biopsy of synovial or juxta-articular tissue, a pathognomic finding, especially in gummatous lesions.
6. Prompt response to antiluetic therapy.
7. No specific response to antirheumatic drugs, colchicine, or sulfonamide derivatives.
8. Roentgenologic studies show only effusion, except in the rare gummatous lesions in which a destructive process may be present in the epiphysis.
9. Charcot joint. See neurogenic arthropathy.

CRITERIA for the Diagnosis of Arthritis of Rheumatic Fever:

1. History of previous attacks of rheumatic fever.
2. Onset a few days to four weeks or more after respiratory infection.
3. Arthritis occurs as part of rheumatic fever and hence is usually accompanied or followed by other rheumatic manifestations, such as; carditis, chorea, erythema marginatum, pleuritis, subcutaneous nodules (which are usually less than 0.5 cm. in diameter, multiple, and usually appear over bony prominences).
4. Fever almost invariably present and often high in early stages; low grade fever later.
5. Arthritis usually polyarticular and migratory and tending to clear in one joint as it spreads to the next. Extraarticular tissue reactions contribute to the symptomatology.
6. Involvement of joints sometimes mild but typically acute, and showing redness as well as swelling, pain, tenderness, and local warmth.
7. Specific response to antirheumatic drugs with relief of arthritis.
8. Dramatic response to Cortisone and ACTH. This, perhaps, is less valuable as a diagnostic criterion because of its non-specific nature.
9. Recovery without residual joint damage.
10. Laboratory findings:
    (a) Leukocytosis usually present and frequently high.
    (b) Sedimentation rate of red blood cells always increased.
    (c) Titers for antistreptolysin O, antifibrinolysin, and antistreptohyaluronidase in blood serum, usually increased.
    (d) Hemolytic streptococcus and sensitized sheep erythrocyte agglutination reactions negative.
    (e) Blood uric acid normal.
    (f) Suggestive ECG changes.
11. Roentgenologic findings: Soft tissue swelling only. No bony damage.

CRITERIA for the Diagnosis of Rheumatoid Arthritis:

1. Systemic involvement, as indicated by anemia and loss of weight. Fever often present, but rarely high.
2. Usually polyarticular and tends to remain in joints already involved as it spreads to new

joints. Affected joints are swollen, but inflammation is usually of an indolent chronic character.

3. Proximal interphalangeal joints affected sooner or later in most cases, with typical "fusiform finger" due to periarticular thickening and atrophy of muscles above and below. In a large percentage of cases, one or more knuckles and the wrist joints are also involved. Knee joints are usually affected early.
4. Tendency to symmetrical involvement.
5. Subcutaneous nodules occur in 10 to 15% of cases. They are most frequently situated on the forearm distal to the olecranon process, but they may occur along the tendons of the fingers and toes or in the occipital region.
6. Vasomotor and trophic disturbances of the extremities are common, especially tingling, excessive perspiration and atrophy of the skin and soft parts.
7. Flexion deformity, subluxation and ankylosis in late stages.
8. Antirheumatic drugs often symptomatically helpful, but not curative.
9. No response to antibiotics and sulfonamides. Striking responses to Cortisone and ACTH with rapid improvement in clinical features: Lowering of sedimentation rate, correction of anemia, improved well being, and subsidence of joint pain, swelling and muscle spasm. Discontinuance of therapy usually followed by prompt relapse. This does not serve as a specific therapeutic test for rheumatoid arthritis since other forms of articular and periarticular disease may show a favorable response to ACTH and Cortisone.
10. Laboratory findings:
    (1) Leukocyte count usually normal. Erythrocyte sedimentation rate practically always accelerated in active cases.
    (2) Hemolytic streptococcus and sensitized sheep erythrocyte agglutination reactions positive in 60 to 75% of cases.
    (3) Antistreptolysin and antifibrinolysin titers usually normal.
11. Rotentgenographic findings:
    Early: Soft tissue swelling and bone decalcification.
    Late: Destruction of cartilage as shown by narrowing of the interarticular spaces due to thinning of the cartilage, and blurring of the whole joint architecture. Marked decalcification of bone. Small punched-out areas sometimes seen in epiphyseal regions. Subluxation and ankylosis.

CRITERIA for the Diagnosis of Ankylosing Spondylitis:

1. The patient is usually a man and in the majority of cases a young man in the second or third decade of life.
2. Symptoms of chronic systemic disease, particularly loss of weight and strength.
3. Low-grade fever and leukocytosis in some cases with frequent secondary anemia; the sedimentation rate is usually rapid.
4. The patient presents a rather typical picture; a thin young man with stooped shoulders and head held rigid. Examination of the lumbar spine reveals characteristic flattening in lumbar region and with marked spasm of the erector spinae muscles. Marked limitation of chest expansion.
5. X-ray usually shows generalized osteoporosis, fusion of the small intervertebral articulations and calcification of the longitudinal ligaments. The sacro-iliac joints are involved in 90% of cases, and often afford the earliest roentgenologic evidence of the disease.
6. Roentgen therapy of considerable value. In early cases, when it is most important that a diagnosis be made, the only symptom may be low back pain. Minor changes in the sacro-iliac joint x-ray then assume decisive importance.

CRITERIA for the Diagnosis of Psoriatic Arthritis:

1. In addition to several swollen painful joints, the patient presents areas of psoriasis on the trunk, extremities or scalp.
2. Several or all of the distal interphalangeal joints are swollen, red and painful, and psoriatic lesions of the nails are common.
3. Hemolytic streptococcus and sheep cell agglutination tests negative (both tests positive in 10% of that group in which the arthritis is typically rheumatoid).
4. In other respects the disease resembles rheumatoid arthritis.

CRITERIA for the Diagnosis of Degenerative Arthritis:

1. When multiple joints are involved, the patient is usually elderly; when nonarticular, the involved joint is often the site of some structural abnormality, previous trauma or previous arthritis of infectional type.
2. Many but not all of these patients are overweight. Evidence of systemic disturbance, such as fever and loss of weight, is not observed.
3. The arthritis is chronic and low grade, unless traumatic synovitis is superimposed.
4. The affected joints are frequently enlarged, due to bony overgrowth. There may also be some soft tissue swelling, but this is exceptional. Crepitation is often demonstrable during motion of the joint.
5. Antirheumatic drugs not specific, but afford some relief.
6. X-rays reveal varying degrees of bone production in the form of lipping or osteophytes at the margins of the joint. Decalcification does not occur. Narrowing of the joint space is frequent, and may be associated with sclerosis of the subchondral bone. Cyst-like areas of degeneration are often seen in the region of the articulating surfaces.
7. Objective findings, clinical as well as roentgenologic, are not always proportional to subjective complaints.
8. Absence of elevated sedimentation rate.

CRITERIA for the Diagnosis of Acute Gout:

1. The patient may be of any age, but in the majority of patients the initial attack occurs after the age of 40.
2. More than 60% of all initial attacks of acute gout occur in the metatarsophalangeal joint of the great toe of one foot or the other. In acute

gout the attack is usually limited to one joint.
3. The onset is usually in the night, and frequently follows trauma or some indiscretion in diet or in the use of alcohol. The pain is often extremely severe. The shoulders, spine and hips are rarely affected.
4. The affected joint is swollen and exquisitely tender. The overlying skin is of deep red color, sometimes purplish, the veins distended.
5. The symptoms usually yield promptly to the administration of therapeutic doses of colchicine.
6. One of the most characteristic features of acute gout is the relatively short duration of the attack with complete remission of symptoms between attacks.
7. The blood uric acid may be high, but in a few cases it is normal or only slightly elevated. Determinations on blood serum are considered more accurate. The effect of drugs in artificially lowering the uric acid blood levels, must be kept in mind.
8. X-rays may be entirely negative. In some cases, however, punched-out areas are observed in the bone along the line of attachment of the joint capsule.

CRITERIA for the Diagnosis of Chronic Gout:
1. The patient invaribly gives a history of preceding attacks of acute arthritis.
2. In chronic gout several joints may be involved. Remissions are incomplete or entirely absent.
3. The affected joints are swollen, tender and painful on motion. The pain, however, is not as severe as that of acute gout.
4. Tophi are usually present in chronic gout and occur most frequently on the ears and about the olecranon bursae. In severe cases they may appear about the joints, particularly those of the hands and feet.
5. The joint manifestations do not yield readily to colchicine except during acute exacerbations.
6. Serum uric acid is nearly always elevated over 6 mg. percent. Whole blood uric acid is usually well over 4 mg. percent.
7. Characteristic punched-out areas of erosion in the bone adjacent to the joint are demonstrable in the x-rays in a high percentage of patients with chronic gout. They are eventually larger than the punched-out areas which sometimes occur in rheumatoid arthritis, and they arise at the attachment of the joint capsule. In advanced cases of chronic gout, x-rays will reveal periarticular thickening and hypertrophic and destructive changes, non-specific in type, which are secondary to the lesions produced by the gout itself.

CRITERIA for the Diagnosis of Traumatic Arthritis:
1. History of injury, either a direct blow or strain.
2. Rapidly developing effusion that may be clear, but often contains fresh blood.
3. Pain and limitation of motion on attempting to force motion.
4. Instability or even gross deformity if the injury is severe.
5. Locking, slipping or even recurrent dislocation may occur.

CRITERIA for the Diagnosis of Joint Distrubances Secondary to Abnormal Postural Strain:
1. Habitually poor posture due to some congenital or acquired deformity.
2. Fatigue and pain on standing are characteristic.
3. Tenderness may be acute and is usually in a ligament.
4. There is no local heat and rarely any swelling, although the full picture of traumatic synovitis may appear.
5. The symptoms are relieved by rest or support.

CRITERIA for the Diagnosis of Psychogenic Joint Disorders:
1. Exaggerated subjective symptoms referable to the musculoskeletal system. Other psychogenic symptoms often present.
2. No swelling nor local heat.
3. Possibly a history or signs of emotional instability.
4. Absence of objective laboratory evidence of organic disease.
5. Distribution of pain beyond nerve and muscle distribution.

CRITERIA for the Diagnosis of Intermittent Hydrarthrosis:
1. The aute attacks of effusion of fluid into the joint, usually the knee, come at regular intervals of usually 10 or 11 days.
2. After a period of four of five days, the fluid disappears from the joint almost as rapidly as it formed, leaving the joint practically normal.
3. A slight rise in temperature and a mild leukocytosis may sometimes be observed during the attacks.
4. Puncture of the joint reveals clear and practically normal joint fluid.

THE laboratory studies that we have found of assistance in diagnosis are the sedimentation rate, blood uric acid, blood count and x-rays. A rapid sedimentation rate raises the index of suspicion particularly in the early rheumatoid arthritis that presents itself with symptoms suggesting a functional nervous disturbance. It is also invaluable in following the progress of a specific case. An elevated blood uric acid may not only give the clue to a hidden gouty diathesis but may also open the door to more adequate therapy. The blood count may point to one of the heterogeneous group of collagen diseases that may masquerade as rheumatic diseases, as, for example, the leukopenia in disseminated lupus erythematosus or the eosinophilia of periarteritis nodosa.

In summary, the accurate medical recording of rheumatic diseases is of importance to the industrial physician in dealing with the problem of chronic disease. Basic to accurate medical recording of rheumatic diseases is an understanding of the diagnostic criteria underlying the proper nomenclature of these diseases and the application of simple and practical laboratory studies.

President's Page

IN ALMOST any large organization it is relatively easy to establish effective methods for the dissemination of informational and other material from Headquarters to the individual members. The provision of channels for a reverse flow, whereby the thoughts and wishes of individual members or groups of members can be promptly and efficiently transmitted to Headquarters, constitutes a more difficult problem. The most satisfactory approach to date has proved to be that of proportionate representation. This method long has been employed in both National and State Houses of Representatives in government, and a similar system operates within the structure of the American Medical Association and its state societies.

In the Industrial Medical Association, the problem is more complex. The location of an industrial plant usually has been determined by the availability of raw materials, power, transportation, and labor. As a result, the industries of this nation and the physicians who serve them are unevenly distributed, being heavily concentrated in some areas, and sparse to absent in others. For this reason, it never has been practical or feasible to establish components of our Association on a state society basis. However, within these areas of concentration, there were many physicians engaged in the practice of Industrial Medicine either on a full-time or part-time basis who were members of our Association. These physicians developed their own local groups for the purposes of meeting and discussion of their mutual interests and problems. To provide some substantial bond between such groups and the Association, many were authorized to constitute themselves official Component Societies of the Industrial Medical Association.

When the Association, in earlier days was struggling to attain both growth and recognition, it apparently had not developed any formal policy or set of standards or conditions regarding the establishment of Component Societies. Perusal of some of the old records, leaves one with the impression that the granting of such status was dependent upon the enthusiasm of a particular local group at a particular moment. As a result, a few Component Societies came in to being only to bloom briefly and then become defunct. A few more remained active for longer periods, only to lapse into relative inactivity in recent years. Fortunately however, others made steady progress both in activity and strength to become and to remain the mainstays of the Association.

This rather loose initial organization of the Component Societies insofar as their relationship with the IMA is concerned has recently served to pose a number of problems. Happily, these problems have been gradually resolved to the satisfaction of both the Component Society concerned and the Association.

As should be, Component Societies play an important part in the affairs of the Association, contributing significantly to its activities and to the formulation of its policies. Under the new By-laws of the Association adopted by the membership at the 1951 Annual Convention, three members of the Nominating Committee of six, must be Presidents of Component Societies. Since this Committee selects the candidates for election as Directors of the Association, and since the Directors formulate the policies and guide the activities of the Association, the importance of Component Societies is evident.

Applicants for membership in the Association who live in an area that is under the jurisdiction of a Component Society, must enter by way of the Component Society. If rejected for membership by the Component Society, they are rejected automatically for membership in the Association. In that more than 50% of the total of new members accepted each year, enter by way of the Component Societies, it becomes obvious that these Societies determine in large measure the quality of the Association's membership.

At present, there are 11 Component Societies of the Industrial Medical Association. The conditions and requirements necessary for the creation of a new Component Society, now are well delineated. Within the past two years, one new Society has been constituted. Several other groups recently formed or in the process of formation have requested consideration for Component Society status. It seems reasonably certain that most, if not all, eventually will be able to fulfill the necessary requirements.

Meanwhile, Industry continues to expand and management is becoming increasingly aware of the value of health services within its plants. The selection of many new plant sites today is influenced by an additional consideration of decentralization for purposes of national security. This is resulting in the appearance of industries in areas of the country that up to now have been almost entirely agricultural. If this trend continues, the prospect of a Component Society in every state of the Union may become an actuality in the not too distant future.

George F. Wilkins M.D.

Industrial Physicians' Luncheon

FRANK R. FERLAINO, M.D., IMA District Counselor, Metropolitan New York and Northern New Jersey, and PATRICIA EDGERLY, New York Medical Exchange, were host and hostess at a special luncheon of industrial physicians at the New York Athletic Club, New York City, June 1, 1953, the opening day of the AMA annual meeting. More than a hundred industrial physicians attended, and all expressed deep interest in the expansion of the IMA Component Society's activities in the area. DR. FERLAINO told the group something about his activities along this line, stating that during the last 12 months more than 50 new members had been enrolled. DR. ANTHONY J. LANZA gave a short talk on "Future Trends in Industrial Medicine," indicating that the era in which any man by virtue of his possession of an M.D. degree could assume the practice of industrial medicine without other qualifications has come to an end, and that the time of necessity for special training and a real appreciation of the philosophy of industrial medicine is already at hand. DR. LANZA also intimated that his group at New York University is now engaged in some important research activities on industrial medical problems. DR. GEORGE F. WILKINS, IMA President, 1953-54, summarized the medical highlights of the recent IMA convention in Los Angeles. DR. ROBERT C. PAGE gave a short talk on the "American Foundation for Occupational Health." DR. EDWARD C. HOLMBLAD outlined the objectives and services of the Industrial Medical Association. It was the consensus of the group that, starting in September, a succession of luncheon meetings be held throughout the fall and winter, and DR. FERLAINO was assigned to develop plans accordingly.

University Activities

Cincinnati

THE Institute of Industrial Health of the University of Cincinnati announces a course of instruction in "Occupational Skin Problems" to be presented jointly by the Division of Occupational Health of the Public Health Service, the Department of Preventive Medicine and Industrial Health, and the Department of Dermatology and Syphilology of the University of Cincinnati, during the week of October 12-16, 1953. The objective is to give physicians a greater understanding of cutaneous problems of occupational origin. The program will be divided into three daily sessions, consisting of morning lectures and clinical demonstrations, afternoon field instruction in industrial plants, and evening panel discussions. The didactic presentations will include a review of the anatomy, physiology, and chemistry of the skin. Consideration will be given to the etiology, clinical appearance, diagnosis, and treatment of occupational dermatoses. This will be supplemented by discussions of specific measures of prevention and control. The evening sessions have been designed to present current information on the subjects of cutaneous cancer, cutaneous allergy, and medicolegal problems. LOUIS SCHWARTZ, M.D., former Chief, Industrial Dermatoses Section, U.S. Public Health Service, will be the guest speaker at the one dinner meeting. He will describe his personal experiences with these problems during the past 25 years. Physicians interested in attending the course may apply to Secretary, Institute of Industrial Health, Kettering Laboratory, Eden and Bethesda Avenues, Cincinnati 19, Ohio. A registration fee will be charged, and early application is advised since attendance will be limited.

Columbia

THE Faculty of Medicine, Columbia University, announces a series of lectures on Occupational Medicine to be given from 9:00 to 10:00 o'clock on Saturday mornings beginning on September 19, 1953, in Amphitheater A, College of Physicians and Surgeons, 630 West 168th Street, New York 32. The lecturers will be members of the staff of the Division of Occupational Medicine of the School of Public Health. Interested members of the medical and allied professions are invited to attend. There will be no formal registration and no tuition fee. The schedule is as follows: *September 19:* History, Scope, Objectives and Practice of Occupational Medicine. *September 26:* Industrial Toxicology—General Principles. *October 3:* Toxic Metals I. *October 10:* Toxic Metals II. *October 17:* Toxic Solvents I. *October 24:* Toxic Solvents II. *October 31:* Toxic Dusts. *November 7:* Toxic Gases. *November 14:* Occupational Dermatoses and Infections. *November 21:* Ventilation; Lighting; Noise. *November 28:* Elementary Nuclear Physics; Radiation Hazards. *December 5:* Workmen's Compensation. *December 12:* Written Examination (Optional). The order in which the topics are presented may be slightly modified depending on the availability of lecturers.

Product Research and Development

Articles in this section of the Journal are related to commercial or prospectively commercial products and, by requirement, are written by physicians, represent original work not previously published, and have some flavor of newness. These articles are published so that newer products may become recipients of further consideration and appraisal in the industrial medical field. The claims and conclusions of authors do not necessarily reflect the attitude or opinions of this Journal, or of any associated organization

Some Causes of Cutting-Oil Dermatitis

PART II— A STUDY OF PROTECTIVE CREAMS

GEORGE E. MORRIS, M.D.
Assistant Clinical Professor of Dermatology, Tufts College Medical School
CLARENCE C. MALOOF, M.D.
Medical Director, A. C. Lawrence Leather Company

IN A RECENT paper appearing in this Journal on the subject: "An Analysis of Some of the Causes of Cutting-Oil Dermatitis,"[1] it was reported that 52 cleansers which were tested were unable to remove fluorescent oils from the skin. This fluorescence was in each instance removable by Lixoil,[8] a new cleanser still under study.

We previously stated that a similar series of tests would be made using protective creams,[2] and that a further report would be made after a sufficient number of them had been tried. Twenty-four such tests have now been completed.

The reason for submitting protective creams to analysis must be obvious. For many years, industrial managements have been urged to furnish their workers with protective ointments, and the workers themselves have been importuned to rub these creams into their skin before the beginning of the work day in order to protect them from the chemicals with which they will be coming in contact. In furtherance, therefore, of our inquiry into the causes of cutting-oil dermatitis, all of the 24 protective creams which we selected for this study were those which, either on their labels or in prior published reports, have been definitely recommended as protecting against cutting-oils.

In 1942, Schwartz[3] advocated the application of protective ointments "which cover the skin and fill the pores with a harmless fat to repel water-soluble irritants and the entrance into the pores of harmful petroleum oils, greases, and coal-tar derivatives." He recommended this class of ointment against cutting-oils, greases, creosote, oil, pitch, and photosensitizing chemicals. His type formula was *anhydrous lanolin*, 70%; *castor oil*, 30%.

Later, Klauder,[4] besides referring to Schwartz's protective creams, also suggested one of his own in which he employed two protective applications, one over the other. Many other writers[5,6,7] have also urged the use of protective creams.

In the course of testing the 52 cleansers, it occurred to us that a like study should be made of the effectiveness of these particular protectives and of 22 others, most of which are on the market under different trade names, to see if they actually would protect against cutting-oil dermatitis. The technique which we used was similar to that followed in the two previous studies[1,2] in that the protective cream was well rubbed into the forearm, following which a small amount of fluorescent cutting-oil was rubbed in on top of this, usually in the form of a circle. Then the forearm was wiped with a clean rag or with absorbent cotton. This latter wiping action was deemed necessary because the worker usually applies a protective cream early in the morning and wipes the oil off his hands with a dry cloth several times during the work period. We tried, by thus wiping the area onto which the protective cream and oil had been applied, to simulate true working conditions.

Of the 24 so-called protectives, only four seemed really to protect. By this we mean that, after the forearm was washed with a strong industrial cleanser, 20 of the 24 creams showed that the fluorescent oil had penetrated right through the protective creams and was not removable from the skin by this strongly alkaline skin cleanser. Not only did 20 of them fail to protect, but five of the protective creams themselves could not be removed with any cleanser that we could find available on the market. Thus, instead of having just a small fluorescent area where the oil was placed, the whole forearm fluoresced after washing with the industrial cleanser. Each one of these studies probably took about five minutes, but had to be done over a period of several weeks because of the irritant action of the cleanser that was used. On subsequent study, some of the oils were allowed to remain on the arm for as long as half an hour,

Read by DR. MORRIS at the Thirty-Second Annual Meeting of the Massachusetts Safety Council, Boston, March 31, 1953.

and then two of the protective creams which had seemed earlier to protect did not now afford any protection.

It has been the age-old custom in hospitals or first-aid clinics to remove oil or grease from the skin of injured workers by the use of ether, alcohol, carbon tetrachloride, or trichlorethylene. When any one of these solvents is applied by means of cotton saturated in the solvent, nothing happens except that the fluorescent oil is spread all over the skin—hardly any of it is removed. One would have to flood the skin with these irritating solvents to remove the oil from it, truly a hazardous procedure in the case of a worker with a severe wound of the skin.

Summary

A STUDY of 24 protective creams has elicited that four seemed to protect for a period of three minutes.

Five protective creams could not be removed with a strong alkaline industrial cleanser.

Two of the protective creams that had seemed to protect for three minutes did not protect for a period of 30 minutes at a subsequent date.

Industrialists should make a study of the protective creams used in their plants to see if they actually afford the protection claimed.

[NOTE: No study similar to this has been reported. The authors are planning to ask eight plants which are using oils to try the four that seemed to protect, and at a future date they hope to report whether there was any less incidence of dermatitis; for, while such four creams might protect for a few minutes, it is far from certain that they will protect throughout the working day.]

(G.E.M., 520 Commonwealth Avenue, Boston 15)
(C.C.M., Peabody, Massachusetts)

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Books

Noise Measurement

HANDBOOK OF NOISE MEASUREMENT: ARNOLD P. G. PETERSON and LEO L. BERANEK. General Radio Company, Cambridge, Massachusetts, pp. 120, $1.00.

This handbook is an innovation. Neatly it mixes up like a chef's salad the intricate requirements of sound measurements with the appropriate devices for that task. Eventually the specifications of various instruments are introduced, and, of all things, the price. There's nothing unholy about that. Naturally those concerned with the control of noise desire to know by the use of what instruments guiding information may be secured, where such instruments may be obtained and at what price f.o.b. Cambridge or Los Angeles.

In this enterprise the General Radio Company has stolen a march on the University of Michigan, which right now is planning an instrument exposition for all industrial hygene devices—soon to be announced. (See page 300.)

This exposition will be followed by a hefty tome assembling technical information right along with the requisite instruments. The pattern already has been set in this present publication. As to Noise—this is it!

For $1.00 an acoustical bargain is available.

In Argentina

MEDICINA DEL TRABAJO: DR. JUAN KAPLAN. Libreria El Ateneo Editorial Buenos Aires, This full-sized text in Spanish is of a format little known to the United States, but undoubtedly characteristic of Argentina. The book embraces all the major aspects of occupational health, but the emphasis leans toward psychological situations among industrial workers, with extensive paging being directed to aptitude testing.

The outstanding import of this book for those in the United States is not the content which mainly follows the pattern of several of our standard textbooks. Instead this admirable book brings to us further evidence that in countries besides our own, commendable strides are being made in the achievement of improved working environments and in the training of physicians and others to bring about these bettered environments.

Letters

Coffee Dust

TO THE EDITOR: *Question*: We are four miles from a plant which manufactures "Instant Coffee." It does not appear offhand, that there have been any adverse effects in the women who work there at the "fillers" although they must inhale tremendous amount of "concentrated coffee dust." No respiratory filters are used. What, if any, effects are associated with the inhalation of powdered coffee?

Answer: Coffee dust as contemplated in the above question will not, so far as now known, produce any substantial pneumoconiosis. Gross exposure to any dust in time may lead to deviation in the markings on the x-ray film, but such conditions at their worst are not more than benign pneumoconiosis leading to no disability and no symptoms. The worst quality of coffee dust derives from the fact that it rarely may act as an allergen, and chiefly producing respiratory impairment sometimes characterized by asthma. It is emphasized that this condition as a true allergy is infrequent. Almost any innocuous dusts, and presumably including coffee, may provoke low-grade upper respiratory tract irritation. This is mechanical and possibly at its worst is not more severe than the well-known "smoker's cough." One of the little known dangers of gross concentration of fine coffee dust is that of explosion. So far as recalled, there have not been any notable coffee dust explosions in this county. However, the possibility exists.

INDUSTRIAL MEDICINE AND SURGERY

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Twenty-First Anniversary

CALENDAR maturity has been achieved by this Journal. October of this year dates its twenty-first birth anniversary. With endless fecundity during these years, industrial medicine has poured out history-making annals of attainment. This Journal, no maker of history, is only the recorder and disseminator of these achievements; its files are the richest repository of industrial medical history throughout its years.

The little-aware creator of the substantial qualities and quantities of industrial health in this country is industry itself. Industrial management has proved to be the foremost contributor to the laudable conservation of the worker's health, his work capacities, his adjustment to work, his attainments as a substantial component of the community. The industrial physician, the industrial hygienist, the industrial nurse, and the safety engineer are but the instruments of industry, furnishing the inspiration, the education of management, the stimulation requisite to this cause. The industrial health team's outstanding monument is the changing of management's attitude from that of the half-hearted, resisting acquiescence of years ago to that of the hearty and generous participation now evident on all sides.

To mark the passing of these years, this Journal proposes for its October issue an edition somewhat different from its usual form. This featured issue is contemplated as one reviewing and portraying the history and victories of the period. Rich in color and portraiture, it will pay tribute to the scientific organizations within the field; the leaders guiding those organizations; the substantial contributions of governmental agencies; the successes of educational institutions through provisions for the training of more and more skilled industrial physicians, hygienists, and nurses; the changing attitude of the entire medical profession as reflected in the commendable activities of the AMA through its Council on Industrial Health; the products of research laboratories following precise inquiries into the complexities of strange and all too frequent occupational diseases; the share introduced by the social sciences in the betterment of the period—opportunities and obligations to pay tribute are almost beyond limit, and certainly beyond the pages even of an enlarged featured issue. Precisely it becomes the intent of this anniversary offering to recognize outstanding industries as standing foremost in the expanding world of worker health conservation. Steel, petroleum, automobile manufacture, transportation, insurance, chemicals, metals other than steel, textiles—these stand out as deserving tribute, but modestly demanding none. Contributions of the manufacturers and suppliers of medical and surgical products and appliances, and x-ray equipment have all helped in many important respects in the growth of industrial health progress. They too will be recognized in this dramatization of the over-all picture because without new treatments and processes developed by them to aid the industrial physician and his findings, progress would have been much slower. The managements of these industries, and others unmentioned, have furnished the monies, the acceptance, the facilities, the personnel, and the enlightenment that have made occupational

health in the United States notable for all the world to marvel. Over and above the multiplying miracles of production that are their daily work these managements are making their attention to occupational health an expression of "the hopes and aspirations for a better world" which every one of them cherishes.

Only a generation ago, sarcastically unimpressed medical Europe labelled a benighted United States as possessing no commendable measures for the proper safeguarding of the minds and bodies of industrial workers. Admitting some justification for scorn regarding conditions of the early decades of the century, the present—without being perfect—requires no defense save as to the "little plant." If you would inquire whether the industries of the United States are concerned about worker conservation, then look about you—even look into this October issue for the answer.

Of all this, your Journal is but the chronicler—a pen broadcasting the betterments produced by others—a pen writing down for all time the protocols and the proceedings. The Journal in this capacity delights in the prospective portrayal of 21 years of occupational health achievement—the achievements of industry itself as provided by its physicians, hygienists, nurses, safety engineers, and government. There is no occasion for shrinking and cringing on comparison with the developments in any land. Still the task is unfinished, and opportunities beckon from every industry. The time is for rejoicing, but the time is not for complacency.

Guidance Clinic

EVERY Annual Conference teaches its own lesson—major progress, minor failure, trivial shortcomings. One of the lessons—springing from the Los Angeles Conference, and apparent to some, but not to all—was that many a registered physician, hygienist, or nurse arrives with his own particular difficulty, hopeful of its solution. That participant may not be particularly concerned in the necessary politics of the occasion; he may not be avidly interested in the total program provided for his general growth and betterment. Instead he is all wrapped up in his own peculiar difficulties. On the program he finds nothing fulfilling his need. He wanders about seeking guidance. He knows that a dozen others among those present must be well familiar with his trouble, but who are these persons, and who will listen? On the closing day he departs well pleased and generally well informed, but sorrowfully lacking as to his own immediate needs. That was a prime reason for his attendance, but he leaves empty handed.

Profiting by this disclosure, it is here proposed that at the next Annual Conference, there be included in the publicized program an informal panel of 12 persons made up of physicians, hygienists, and nurses who fully will be available by appointment for the guidance of these bothered inquirers. By no means should this panel continually sit in its entirety, and perhaps the entire panel never should assemble. A room for this purpose should be set aside and publicized. At all times within designated hours, at least one person should be on duty, and perhaps none other than a secretary.

By arrangement, and confidentially so if desired, anyone attending the Conference seeking information on any topic may lay before suitable numbers of the panel members requests for information not constituting any part of the formal program. It is not conceived that then and there all difficulties may be brought to a happy ending. Rather the function of this guidance clinic should be to point out those individuals also present, most familiar and best experienced in any situation. It is often true it only may be necessary to direct attention to published brochures or books devoted to the topic. Unfailingly within the panel membership someone or all will be more familiar than the inquirer with almost any need. This panel, instead of necessarily being a body for problem solution, will become a steering committee to full information.

Should this be done, some three score of those in attendance will depart without that feeling of personal emptiness—singing the praises of the Association and calling upon Heaven for continual blessings on all.

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*Peshkin, M.M., and others: Ann. Allergy 9:727 (Nov.-Dec.) 1951.

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News, Comment, Opinion

SENIORS in the University of Wisconsin's Department of Preventive Medicine and Student Health spend three and one-half days in an industrial plant that has a functioning health program. With the plant physician, they discuss and observe the handling of occupational hazards, industrial poisons, safety programs, noise control, sanitation, personnel problems, job placements for the handicapped, care of common injuries and the like.

—*The Medical Advance*, 1:7 (June) 1953.

A Boss Is a Boss Is a Boss

BOSSES who feel their best intentions and efforts are at times not fully appreciated may take comfort from an observation made by labor columnist Victor Riesel. Mr. Riesel recently reported in his syndicated column that the CIO office union which services Walter Reuther's UAW-CIO office in Detroit cast their votes against Walter Reuther in the balloting for a new CIO president. He also reported that the CIO office union which services Allan Haywood's office in Washington voted against Allan Haywood in the same election. His conclusions: ". . . A boss is a boss is a boss."

—*Employee Relations News Letter* (Employee & Plant Community Relations Division, General Electric Company, New York); quoted in *Management Review*, March, 1953.

Accident Hazard?

JAMES W. CARPENTER, vice-president of the Long Island Lighting Co., told the safety experts that a dazzling blonde secretary may become as great an accident hazard to a company executive as a high-tension wire. He suggested that when an executive acquire such a secretary with a new job, he take her to his home, call his wife to the living room, and explain: "Take a look at her. I didn't hire her. She came with the new job."

—*New York Herald-Tribune*, March, 1953.

Safer on the Job

AMERICAN industry seems to be doing a better job than the community when it comes to protecting the worker's health. For every day's work lost through job accidents or illness, nine are lost through some off-the-job ailment, a Public Health Service official reports. Hailing the "golden age" of industrial medicine, Henry N. Doyle of the PHS Division of Occupational Health, points out that the inside of the average industrial plant today is safer than the outside. Approximately 2,000,000 men and women, he reports, are absent from work every day because of sickness or injury. Of the total: 10% are due to a job accident or ailment; 30% are due to emotional disorders, some of which "may be related to the work situation"; 60% are due to "such illnesses as the common cold, influenza, digestive disorders, heart diseases and non-industrial injuries." Some employees, he conceded, may be reporting ill when they actually are "off for personal reasons."

Industrial Medical Practice

UNDER the joint sponsorship of the Harvard University School of Public Health, the American Academy of General Practice, the A.M.A. Council on Industrial Health, and the Liberty Mutual Insurance Companies, a seminar on the fundamentals of industrial medicine was held April 3-4 at the School (55 Shattuck St., Boston). Subjects for discussion were industrial injuries, with emphasis on compensation laws, claims handling, and safety; occupational diseases, with particular attention to problems of diagnosis and of evaluation of the severity of a toxic exposure; industrial medical practice, including its aims and scope, its industrial relations aspects, and its relationship to private practice; and the role of industrial medicine in the country's problems of medical care.

—*J.A.M.A.*, April 25, 1953.

"A Certain Type of Fool"

QUESTION: "Is there one thing everybody can own but never sell?" ANSWER: Yes, says Judge Pfaff—safe driving. Last year traffic fatalities were more than four times as great as the number of our servicemen killed by the Communists in Korea. The judge named as the seven deadly sins of driving: speeding, drinking, discourtesy, recklessness, carelessness, physical deficiency and mechanical defects. All these

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Medical Director: (163) Graduate, Class "A" school; past six years, Medical Director, important company having both domestic and foreign plants; qualified to initiate all policies regarding industrial health including health examination plans and operating manuels; excellent knowledge New York workman's compensation laws; able administrator; late thirties.

Medical Director: (164) B.S., Ph.D., M.D. same leading eastern school; well qualified surgeon; past six years, Medical Director, important company in steel industry; excellent administrator; numerous publications; active in industrial medical affairs; highly recommended.

Medical Director: (166) Certified Internist; F.A.C.P.; past five years, Medical Director, one of country's most important companies (25,000) employees; Able administrator; sympathetic with management problems; experienced in public relations; active in industrial medical affairs.

Staff Physician: (167) Graduate Hahnemann Medical; well qualified internist; experience includes eight years, internist, and medical officer in charge; finishing two year post-graduate, Law; wishes industrial medicine.

Industrial Nurse: (168) 37; B.S.; trained, Johns Hopkins; single; several years, staff nurse, USA Nurses Corps; past seven years, Head nurse, important industrial plant; licensed, California; prefers West Coast.

Industrial Nurse: (169) 43; about 15 years experience including private duty, office and industrial nursing; four years, head nurse, important steel plant; licensed, Pennsylvania, New York, California; any locality.

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sins can not only be remedied, but stopped. The judge nicknamed as bad drivers Messrs. Henpecked Henry, Inferiority Complex, Exhibitionist, Cheater, Casanova, Hula-Hula and Dreamer. A certain type of fool includes them all.

—From "Let's Explore Your Mind," by ALBERT EDWARD WIGGAM, SC.D., in *Chicago Daily News*, April 10, 1953.

Who Buys

DIRECT purchasing by Industrial Relations department—though not reported by majority for any service—was more common in small firms, with percentages getting progressively smaller as companies got larger. Below is a breakdown of percentage of total participants purchasing directly, according to employee service: Food and beverages, 13.8%; vending machines, 17.1%; recreational equipment, 33.0%; testing forms and equipment, 42.6%; printing services, 34.1%; office supplies, forms, etc., 22.3%; civil defense equipment, 19.1%; community relations material, 36.1%; medical supplies, exams, 30.8%; security equipment, 22.3%; first aid supplies, 23.4%.

—*Personnel Executives' Newsletter* (Deutsch & Shea), 3:10 (May 29) 1953.

Danger

DANGER in the use of fish lens protein in the treatment of cataracts is pointed out in the June 20 *J.A.M.A.* Warnings were sounded in a special report by the division of medical sciences of the National Research Council, and in a report of a New York ophthalmologist. Widespread interest in the nonsurgical treatment of cataracts with injections of fish lens protein was shown after publication of an article on alleged benefits, which appeared last September in a scientific weekly (*Science*). The principal author was R. F. Shropshire, an ex-convict who has posed as a doctor of medicine. Shropshire, according to latest authentic information, is being held in Florida State Prison at Raiford for a hearing on alleged violation of parole. He had been sentenced, after pleas of guilty, to two consecutive five-year terms for forging prescriptions for narcotics. Cataract Institute, Inc., was formed in New York. A clinic was established at South Kortright, New York, last January. The Drake Hotel at Stamford-in-the-Catskills, New York, was converted into a special residence to accommodate patients and guests coming to the cataract clinic for treatment. In view of the interest displayed by the public, the Council of the American Academy of Ophthalmology and Otolaryngology asked the National Research Council to make an investigation of the author's claims. The Council's Committee on Ophthalmology was assigned the study. The National Research Council's report said, in part: "In summary, the Committee found nothing in the theoretical background or in the experimental and clinical results of this therapy to recommend it. It did, how-

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ever, find exidence that the treatment might seriously interfere with the subsequent surgical removal of the cataracts that it had failed to cure. Because of the total lack of evidence that the lens antigen treatment of cataract described by Mr. R. F. Shropshire has any efficacy; because adequate evidence is now available to the committee that it is, in fact, without demonstrable efficacy; and because treatments of this type have been thoroughly investigated in the past and proved not only invalid but potentially dangerous to the patient, this Committee does not recommend further investigation of this treatment by any agency." Dr. Goodwin M. Breinin, of the Department of Ophthalmology, New York University Post-graduate Medical School, in the current *J.A.M.A.*, reported three cases in which the fish lens protein was used. He concluded: "Promiscuous use of fish lens protein in the therapy of cataract is a dangerous procedure that may induce a state of hypersensitivity. This may be manifested in the development of uveitis (inflammation of the iris) due to an antigen-antibody reaction with the patient's own lens, and secondary glaucoma may also occur. Rapid maturation of cataracts has occurred during fish lens protein treatment."

—*AMA Release*, June, 1953.

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—From an address by R. J. M. ARTHUR, M.D., Hawaii Medical Association, in *Maui News*, May 6, 1953.

Who Gets It?

THE LION'S SHARE of national income goes into the pockets of employees, according to figures compiled by Harding College at Searcy, Arkansas. The breakdown on distribution shows that 65% goes to employees, 9% to professional men and unincorporated business, 7% to farmers, 4% to landlords, 4% to stockholders, 4% to bond holders and other lenders, 2% back into business for expansion, and 5% to taxes. Research conducted by the University of Notre Dame reveals further that 73 cents out of every dollar of interest, dividends, and rent payments to individuals go to people with less than $100-a-week incomes.

—*Steel*, March 9, 1953, quoted in *Management Review*, May, 1953.

The Doctor and the Press

DOCTORS *and representatives of the press may differ:* The doctor searches cautiously for the exact truth. The press representative is interested in the exact truth immediately. The doctor is technical: "a compound comminuted fracture of the tibia and fibula." The press representative

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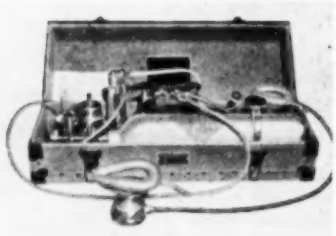

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—Public Relations Committee, West Virginia Medical Association.

Executive Examinations

IN RECENT years, management, recognizing the sizable investment in its executives, has insisted that they have annual health examinations and the move has paid off in healthier, more efficient workers. Among 575 men examined in one year for a large corporation there were 26 with duodenal ulcers; 51 with hypertension; 29 with generalized arteriosclerosis; six with coronary heart disease; three with angina pectoris; 28 with prostatic hyperthrophy; four with early pulmonary tuberculosis; 30 with arthritis of the spine; eight with diabetes; 37 with obesity; and 48 with anxiety, tension and exhaustion. A total of 802 abnormalities were disclosed, most lending themselves to correction.

—From "The Social Impact of Longevity," by CHARLES SELLERS, M.D., in *J. Michigan State Med. Soc.*, May, 1953.

Dividends

STUDIES made in small plants in Connecticut, show that medical service pays comparatively large dividends. Here are some of the findings: One company with over 600 employees reported a reduction of 50% in eye cases; a reduction of more than 50% between 1945 and 1951 in accident frequency, absenteeism, and employee turnover; a 30% reduction between 1947 and 1948 in lost time from all causes and a resulting production increase of nearly 30,000 dollars. There was a 55% reduction in lost time between 1945, the year before the program started, and 1948. Another company with 500 to 600 employees reported a reduction of 35% in the frequency rates of occupational cases, but no reduction in the severity rates. There was a reduction in physicians' services of 1,900 dollars. In 1947, before joining a group medical plan the company paid 4,934 dollars for medical services; after joining the plan, its share of the physician's salary plus fees to outside physicians amounted to 3,030 dollars. During 1948 an estimated possible loss of 1,200 hours of employees' time for treatment outside the plant was eliminated.

—*Safety Maintenance & Production*, May, 1953.

Frankfort Arsenal

INDUSTRIAL MEDICINE is that specialized medical practice which has for its object the maintenance of employees at their physical and psychological optimum. Industrial medicine is human preventive maintenance. It is not hard to "sell" an industrialist on the idea of preventive maintenance programs for his plant and machinery because he can readily check his investment in these things and naturally desires to protect this investment. Industry as a whole, and each individual employer has an investment in his employees, too, which cannot be seen quite as readily as the capital investments referred to, mainly, because we have not been taught to capitalize some of the following: (a) Cost of selecting and training an individual. Depending on the skills involved and the unit value of materials handled, this may run from a few hundred to thousands of dollars. Included in this cost is the number of rejects or amounts of poor work done by the inexperienced worker. General Eisenhower said he learned to fight the war by making mistakes, and, generally speaking, most of us learn our jobs the same way. (b) Cost of supervision—the average intelligent worker requires as much supervision in the first year of employment as he does over the next 29 years. This is part of the training cost but deserves special mention since it accentuates the way in which the other training costs can be amortized. For example, John Doaks works as an instrument worker and in the first year in your employ his production is down 5% and his work is 50% off on quality. His gross output amounts to $20,000. It has cost you $2,000.00 in cash to train him. Over the next 29 years you can amortize

this investment so it figures out to $75.00 annually. Add to this figure the cost of supervisory hours per week the first six months and one hour per week the second six months and your investment is increased by two or three hundred dollars. Thus the minimum cost which should be considered as a capital investment in manpower, to hire a skilled mechanic, figures out to nearly $2500. Rigid inspection is carried out in the receiving department of a plant to insure that materials meet specifications for the job. A good pre-placement examination does the same for the human (perhaps the frailest and costliest) portion of your operation. Your material inspection is a continuous process, checking on the manner in which the raw material stands up under machining, pressing, drawing or other operations. The annual physical examination is the continuous inspection of your manpower. Materials being subjected to special stresses and new processes are afforded special inspections and considerable research work is carried on in every plant. The periodic examination of employees handling toxic substances or performing hazardous jobs is the human counterpart of this continuous inspection and the development of suitable hygienic surroundings, naturally results from the research in ways and means of improving the employee. At Frankford Arsenal, the health program has reached a high degree of effectiveness at a cost of less than 50% of the national average. This program which is adaptable to any plant, however small, consists of the following: (a) Preplacement examination, including chest x-ray, urinalysis, blood test, (electrocardiogram on persons over 45). (b) Annual health examination. (c) Periodic examinations for those handling toxic substances or employed at hazardous jobs. (d) Dispensary service for treatment of occupational diseases and injuries only. (e) Prompt referral of all non-occupational illness by a form letter to the family doctor, reduces absenteeism due to illness by correcting these conditions early. This also enables the Arsenal physicians to become acquainted with private practitioners, which helps in sick leave control. (f) Public health service which has as its object the supervision of employees who have VD, TB, or other diseases which may handicap them but not render them unemployable. The Arsenal is committed to active participation in the "Hire the Handicapped Program" and the results are most gratifying. (g) Environmental Health Service, has as its special function the determination and control of those conditions of the plant or its operations which constitute health hazards, which always are reflected in reduced efficiency of employees and so increase the unit cost of whatever is being made. So far, we have considered only the cash value to industry of a real industrial medical program but there is another benefit which cannot be so easily measured by the dollar scale. This is the increased respect and loyalty to be expected by a real "human relationships" program.

—*The Nor'Easter*, Philadelphia, April, 1953.

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Executive Turnover

TURNOVER among American business executives in recent years has been at a much higher rate than it was a decade earlier, according to a report by Booz, Allen & Hamilton, Chicago management consultants. From 1948 through 1952 industry added executives 46% faster and lost them 29% faster than from 1938 through 1942, the report said. The figures were based on a study covering more than 1,000 executives in 100 companies. Post-war economic expansion seems to have played an important part in the more rapid turnover, explained the firm. It said additional jobs for executives have been opening more than four times as often since World War II as before the war. Executives changing their employment are substantially in agreement in the major reasons for seeking new jobs. The consulting firm interviewed 422 job seeking executives ranging from presidents to department heads. They revealed 28 reasons for moving but nearly two-thirds of the 422 advanced one or more of the four frequently mentioned reasons. The top reason was a desire to step up immediately to a bigger job with more responsibility. It was mentioned by 126. A desire to find greater opportunity for future growth was cited by 91 and increased income by 75. The fourth reason—to terminate an unhappy situation involving policy differences—was mentioned by 68.

—*Chicago Tribune*, April 30, 1953.

Rejections

IN BRIEF remarks at the meeting of the President's Committee on Employment of the Physically Handicapped, the author calls attention to wide differences in the employability standards among states, industries and plants. The rejection rates for prospective employees varied from 0.5% to 20% in the plants of one company. He gives the following reasons for wasteful rejections: (1) inherent working conditions in some plants (rarely); (2) lack of appreciation of the useful skills of handicapped persons; (3) long-range employee program requiring long training periods; (4) lack of interest and understanding on the part of the examining physician; (5) scientifically unsound rulings on aggravation of pre-existing disabilities; (6) inflexible rules in some labor contracts whereby new employees are placed on arduous jobs; (7) lack or inadequacy of second-injury funds; and (8) denial of periodic examinations where they should be given. Doctors in industry have become increasingly aware that only three factors need consideration in placing a new worker on the job: (1) his ability to do the work; (2) safety of the job as related to his handicap; and (3) health of the prospective employee, for his own protection and that of his fellow employees.

—From "The Physician in Industry," by O. A. SANDER, M.D., in *Performance*, 3, 4 (March) 1953; abstr. in *Industrial Hygiene Digest*.

On a Par

ALTHOUGH we have felt for many years that our handicapped personnel are at least on a par with our unimpaired employees, we only recently made a factual study. This study in effect matched impaired and unimpaired people under conditions as nearly identical as possible. Comparative performance was recorded of individuals in the same age and experienced group, doing the same kind of work under similar conditions. The record revealed that impaired individuals consistently performed in a manner equal to, and in some respects better than did unimpaired personnel. Handicapped people were found to be more regular in their work attendance than the unimpaired. They were found to have a better record with respect to nondisability-on-the-job injuries, and their production rates were as good or better than average.

—From "The Physically Handicapped in Industry," by JOHN K. NORTHRUP, in *Connecticut State Med. J.*, May, 1953.

The Coroner

THE coroner (originally "crowner") was defined by Coke, the authority on English law of the 16th Century, as keeper of the pleas of the crown. It is certain that the coroner was a well-established official by about 1200 A.D. in England, although the office is probably more ancient than that. Originally this powerful official was a knight who attended to matters in which the king had a direct financial interest. Then, the property of felons and suicides was forfeited to the crown, making it necessary for the coroner to be closely associated with violent death of various sorts. He also took charge of treasure trove and certain fishes, such as sturgeons and whales, which were washed onto shore; wrecked ships were also his responsibility. By about 1300 A.D. the coroner had become more occupied with the holding of inquests over the bodies of persons dead by violence. The office progressively de-

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—FREDERICK D. NEWBARR, M.D., and RICHARD O. MYERS, M.D., in *Ann. West. Med. & Surg.*, (July) 1951, quoted in *Current Med. Dig.*, April, 1953.

Prolonged Illness

WHICH EMPLOYEES account for most of the long-lasting illnesses and absences from work? The old men, who should have been retired long ago, perhaps? The women, who may not take their jobs very seriously? The unskilled, who have no craft to be proud of? Actually, it's none of these. A sample survey of some 40,000 industrial and commercial workers, conducted by the Research Council for Economic Security, showed skilled male workers took by far the greatest number of long absences for illness, per capita. The Council warns against applying the figures from its small sampling to other groups. But it admits that the difference between male skilled workers and all other classifications—male, female, unskilled, supervisory, management, clerical—appears "significant." Male workers, the study showed, in general had a higher rate of prolonged illness (9.2 per 1,000) than women (8.1). Clerical workers had rates of 6.4 among men, 5.6 among women. Male supervisory workers had an astoundingly low rate of prolonged illnesses—2.9 per 1,000 perhaps misleading because the sample was small. But the male skilled workers' rate was 14.9. "Prolonged illness" was defined as a non-occupational illness keeping the employee from the job for more than four weeks.

—*Modern Industry*, February 15, 1953, quoted in *Management Review*, May, 1953.

Boomtown, 1953

WHITE PINES, Michigan, could be called "Boomtown, 1953." It shows what a company has to do today, healthwise, to put a new community on the map—in contrast to the old days when a few wooden shacks were thrown together around a mine shaft and given a name. The town was conceived, laid out, built and put into operation completely from scratch by the White Pine Copper Company, Boston, to house employees and their families at a new $40,000,000 mining and smelting project in Michigan's heavily wooded, sparsely settled upper Peninsula. The company got advice and help from the American Medical Association's Council on Industrial Health, the American Hospital Association, and Pace Associates, town planners. What was needed was a permanent home for some 2,000 people, plus an expected 50 to 60 new babies every year. That meant providing modern homes, health and medical services, shopping and recreational facilities, schools, churches, police and fire protection, municipal services, and a town manager. Health, medical, and hospital services had high priority. A 20-bed general hospital (opened in June) will house all the medical services, including a maternity section, pharmacy, and facilities for minor surgery. Elaborate precautions against silica dust have been set up. There will be a Medical Director, a dentist, nurses, and, if required, a public health doctor. The Medical Director will be the company doctor. He will handle pre-employment examinations and routine x-rays. Otherwise, his relations with the townspeople will be those of a private physician. More than 400 single-family houses, plus three apartment buildings for unmarried workers, will be needed by November, 1954, when the project is expected to reach capacity. Tenants ultimately will be encouraged to buy their homes. A 500-foot smoke-stack was erected at the plant to carry away smelter fumes, and the townsite was selected with a view to prevailing winds. The company will employ approximately 830 persons, including office help. Of these, 350 are expected to come in daily from the surrounding area. The others, plus 120 service workers —nurses, school teachers and people employed in the town center—will live in White Pine.

The Medical Advance, (published by the National Fund for Medical Education), 1:7 (June) 1953.

Headache

A REAL personnel-department headache is loss of man-hours resulting from chronic headaches. At least 8% of all absenteeism stems from this pesky affliction, while productivity is immeasurably drained due to headaches suffered on the job—according to information from Montefiore Hospital Headache Clinic, Bronx, New York. "Constantly improved methods of treatment have enabled us to reduce the frequency and severity of chronic headaches, and in many cases effect a cure," Clinic's Director told *P.E.N.* These methods can be utilized by in-plant Medical Departments to afford permanent relief to suffering employees, also raise output. First step is to determine type of headache by recording detailed history of attacks—de-

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scription of onset, frequency and time of occurrences, severity and location of pain, etc. Appropriate drug is then given to relieve pain. Most drugs currently in use are powerful, require doctor's supervision; aspirin tablets rarely affect chronic headaches. Final step is attempt to get at basic cause (for which ache itself is merely symptom), prevent future attacks. Clinic claims that most effective procedure is psychotherapy, since majority of chronic headaches have been found to be rooted in anxiety, frustration, suppressed hostility, etc. Company physicians can employ psychotherapy successfully if he is able to listen patiently and create atmosphere of trust. Physician should also recommend different kind of work if patient's job is found to be tension-producing. If conditions warrant, hobbies and other recreation should be suggested to balance work-schedules.

—*Personnel Executives' Newsletter*, 3:9 (May 19) 1953.

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pany may not fire an employee for being asleep on the job unless it has first taken the precaution to awaken him. Regardless of appearances, the only conclusive proof that an employee is asleep would be some overt attempt to arouse him. In the present case, the employee's defense was that he was merely resting after an arduous hour and a half of work. The NLRB arbitrator pointed out that the burden of proof is certainly upon the company in such cases to establish the fact that the man was indeed asleep while on duty. However likely the contention of the company and however probable the event supporting the company's reasonable conclusion, it must still be established as an unqualified fact. Undoubtedly this decision will create many amusing incidents in its application. The answer as to whether one may be sleeping when he is resting or resting when he is sleeping will undoubtedly involve a great many technicalities.

—*Economic Intelligence*, quoted in *Management Review*, March, 1953.

Job Re-Engineering

DURING a visit to Germany, I noticed a striking example of job re-engineering. Faced with a severe manpower shortage after the war, factories devoted their attention to modifying jobs so that disabled individuals could do them. I noticed a ticket collector who had only one arm; the other was lost in service. It was explained to me that before the war the man did the same work. When he returned disabled, he was not only reinstated in his old job, but the job was modified for him. In his case the punch which he formerly operated by hand is now attached to a long standard which can be operated by his foot.

—From "Arthritis and Employment," by HENRY H. KESSLER, M.D., in *Connecticut State Med. J.*, May, 1953.

General Electric

MILLION-DOLLAR industrial hospital being built at Schenectady, New York, by General Electric for its 41,000 employees. Completely modern, it will give pre-placement exams, and emergency treatment for ill or injured persons. Industrial hygiene lab will be provided to study work environments and lessen hazards.

—*Personnel Executives Newsletter* (Deutsch & Shea), June 19, 1953.

The Medical Dollar

ACCORDING to the companies which reported in the Brookings survey, here are the things the boss buys with his medical plan dollar: A cut in industrial accidents by rates varying from 40% to 52%. A reduction in incidence of occupational disease by about 45%. A reduction in insurance payments by as much as 50%. Those are things he can measure in dollars and cents. In addition, he can figure on gaining these intangibles: Better job placement, a healthier working force, improved worker-management relations, improved community relations, reductions in turnover and absenteeism, safer use of handicapped persons, and —because of all this—higher output. If you are an employee, a sound, well-run plan for medical care within the plant means these things: You can be sure you are

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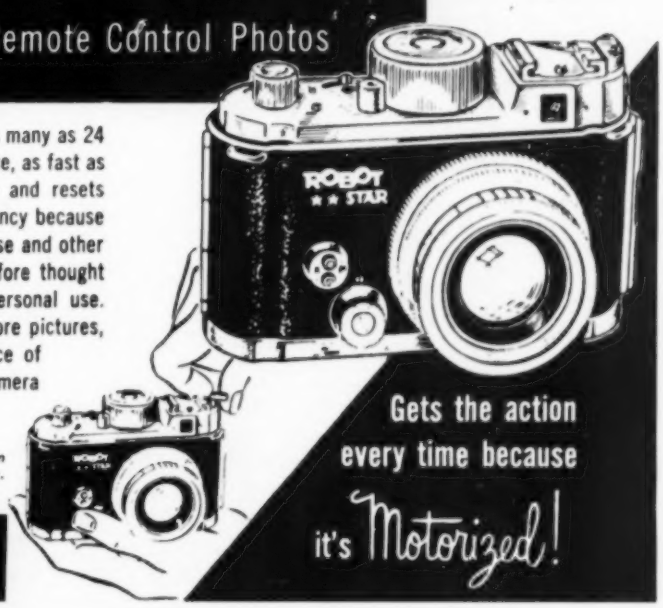

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—From "Should the Company Hire a Doctor?" in *Changing Times*, The Kiplinger Magazine, January, 1953.

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Employers Pay the Bills

UNDER the private enterprise system of providing workmen's compensation, such as we have in New York State, the role of government is a restricted one. Those who require hospital care, those who furnish it, and those who pay the costs, are the chief parties in interest under the private enterprise system. In the case of hospital care, there is a curious merger of these interests. Doctors who are members of hospital staffs determine whether hospital care is needed, and boards of the voluntary hospitals are usually more representative of the employer and stockholder groups than of any other segment of the community. Thus, the hospital is squarely faced with the problem not only of providing good hospital care in workmen's compensation cases, but also of providing it on terms fair to its own best supporters. Employers pay the bills, in final analysis, not the insurance companies. This relationship creates quite a different situation from that in most states. For example, in neighboring Pennsylvania the Legislature has placed a ceiling of $300 over the hospital bills an employer pays for a work-injured employee. You know how little in modern hospital service $300 will buy. It follows that, in Pennsylvania, the hospitals themselves, through free services, private welfare agencies and tax-supported relief, pick up the tab for literally millions of dollars in hospital and medical services that in New York are bought and paid for by private enterprise.

—MARY DONLON, Chairman, New York State Workmen's Compensation Board, addressing New York State Hospital Association, Atlantic City, May 21, 1953.

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REFERENCES:
1. Gastric Tolerance for Aspirin and Buffered Aspirin. Ind. Med. 20:480, Oct. 1951.
2. Effect of Buffering Agents on Absorption of Acetylsalicylic Acid. J. Am. Pharm. Assoc., Sc. Ed. 39:21, Jan. 1950.

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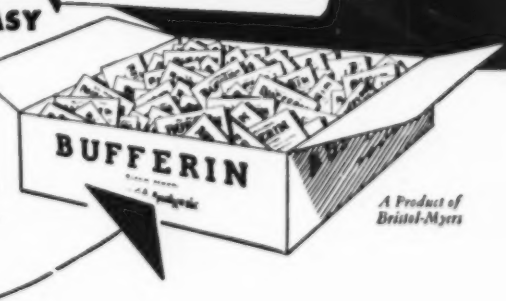

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